TECHNOLOGY DEPT.

AMERICAN MACHINIST

JULY 8, 1943

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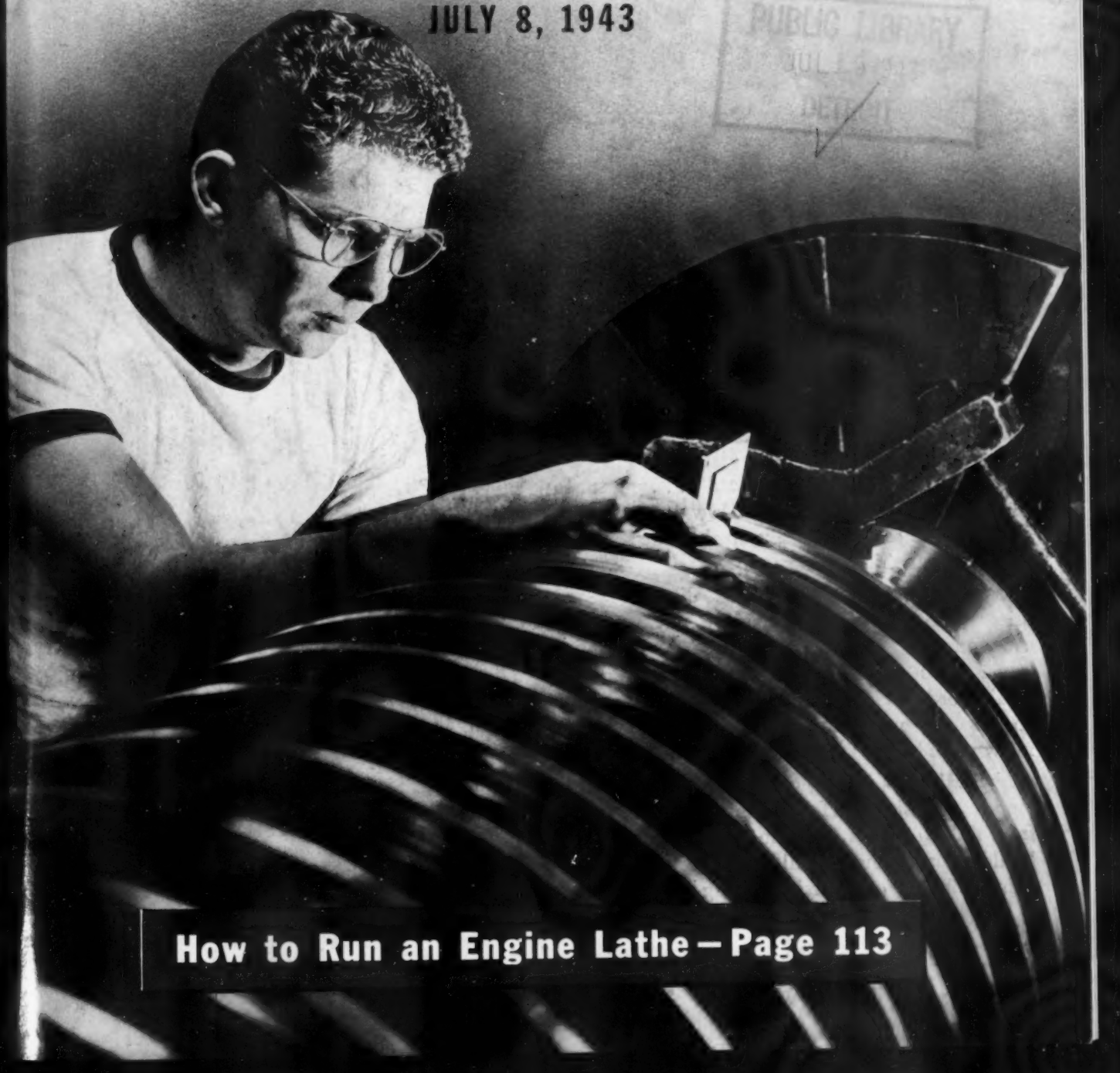

How to Run an Engine Lathe—Page 113

R v. 87 pt. 4 Jy-Ag '43

Take a Lesson from a Tin Fish

"Enemy destroyer dead ahead" . . . a torpedo plane swoops down level and low . . . a tin fish drops to the sea and streaks straight and true to blast another ship to destruction.

It takes over 5000 parts and 1200 different assemblies to make one of these complicated weapons and every one must be accurate to the closest tolerances, because the slightest error would mean no hit. Heald Bore-Matics have been chosen in many plants to help put much of this deadly precision into many torpedo parts.

If you have a boring or grinding problem that requires precision and fast production, take a lesson from the tin fish . . . by bringing your problem to Heald. Our engineers will gladly help you solve your problems of precision boring and grinding.

Precision boring, facing and chamfering operations are performed in each of the four hubs on Torpedo Bodies on the Heald No. 46B Bore-Matics shown above. The Bore-Matic is arranged with a single boring head carrying four tools and a horizontal rotary indexing fixture for indexing between operations in each hub. The part is located in the fixture on a vertical stake and from one dowel hole, and is clamped against the bottom face by a "C" washer and nut on top.

The Heald Machine Co., Worcester, Mass., U. S. A.

For More Precision Faster, bring your problems to Heald

Tech

AMERICAN MACHINIST

July 8, 1943

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RETURN POSTAGE GUARANTEED

VOLUME 87 NUMBER 14

AMERICAN MACHINIST. Copyright 1943 by McGraw-Hill Publishing Co., Inc. Published every other Thursday, price 35c a copy. Allow ten days for change of address. Address all communications about subscriptions to the Director of Circulation, American Machinist, 330 West 42nd Street, New York, N. Y. Subscription rates—United States, Mexico and Central and South American countries, $5.00 a year, $8.00 for two years, $10 for three years. Canada, $5.50 a year, $9.00 for two years, $11 for three years. All other countries $8.00 a year, $13.00 for two years $16.00 for three years. Entered as second class matter, September 29, 1936, at Post Office, Albany, N. Y., under the act of March 3, 1879. Printed in U.S.A. Cable Address "McGrawhill, New York." Member of A.B.C. Member of A.B.P.

A McGRAW-HILL PUBLICATION

PRINTED IN U. S. A.

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AMERICAN MACHINIST chips

Oyez, Oyez . . . Nothing much surprises us these days about the sprawling giant that is Metal-Working. It *was* a bit unusual, though, to hear from Van Buren Perry, Judge of the Fifth Judicial Circuit of South Dakota. He writes "At the machine shop where I work on a night shift I chanced on the May 27th issue of your magazine with the splendid poem 'Question for Americans'. I would like very much to have a dozen copies of this and I assure you they will be displayed in the court houses of my Circuit."

It's a pleasure, Your Honor . . . and we hope some of those arraigned before you will take the poem's potent message to heart.

o

Ladies' Day . . . *The influx of the fair sex into industry seems bound to continue. According to a recent OWI survey, the U. S. will be able to meet its wartime manpower needs only by careful management and by drawing 1,900,000 women and 800,000 older men into the manpower pool. Certainly adds up to a lot of empty kitchens, and reminds us once more of the great need for technical training data.*

o

Hidden Talent . . . Speaking of the manpower situation (and who isn't!), we were very interested in a public statement made by S. E. Lauer, head of The York Ice Machinery Corporation. Some months ago, he explained, the company made a private manpower survey designed to discover hidden talent in its labor force. This developed a reservoir of skilled labor, as every man in the wage group proved to be qualified in at least one additional skilled job. Many showed four or five skills. The machine tool operators proved the most versatile and in this group alone 25 additional skills, all useful in war work, were unearthed.

This new knowledge was put to work immediately. Men were transferred from departments where there were temporary lulls to those that were overloaded. A particularly handy scheme, it seems to us, to help solve the problem of sudden shifts in production requirements caused by the changing needs of our armed forces. Perhaps this labor-finding idea can be applied in your shop.

o

"Life" Goes to the Head of the Class . . . *Neatest journalistic trick of the week of June 21, in our humble opinion, was the illustrated note that* Life *magazine addressed to one Sergeant Grant, then in North Africa. The idea was to show the Sarge (and* Life *readers) pictures of his cute six-months old daughter, whom he had never seen, and to convey a few bits of dear-to-the-parent gossip about how well the young lady was eating, etc.*

American Machinist *has been duly scooped, for it occurred to us too late that it would have been a good idea to reverse the process and publish for the wives and families of some of our readers news and pictures of their pappies . . . who currently spend practically all of their time at the plant. Those war-work-immersed guys whose children are now saying every Sunday, "Mother, here's that man again."*

o

We Wonder, Gunder . . . Those of you who have been following the story of the Swift Swede runner on the sports page know that he is very appreciative of the nice reception America is giving him. But he should be, if he isn't, somewhat put out at the way his name is being kicked around. Three different papers today spelled it "Gunder Haegg . . . Hagg . . . Hagg". We believe the "Hagg" people are in the majority, although that doesn't prove they're right. It probably is unpatriotic of us to mention such a minor annoyance in these days of important war, but if Gunder keeps making the headlines all summer it may develop into an international incident. Never can tell about these things.

NOT QUITE THIS BAD WITH AMERICAN MACHINIST YET

OH, PLEASE, I KNOW I FORGOT TO SUBSCRIBE- BUT, PLEASE SELL ME A PAPER!
News boy's ARMORED CAR DELIVERY BY APPOINTMENT ONLY
HINDMARCH

—*Mida*

MARINE REDUCTION UNIT

750 H.P.
from
850 R.P.M.
to
500 R.P.M.

Marine drive manufacturers, faced with the problem of making better reduction units than ever before, have found that bevel gear planetary units meet and surpass their production and performance requirements.

Examine the advantages these units offer:

1. Compact, light, straight-line design
   Unit shown is only 18" diameter.
2. High load capacity
   Multiple pinions share load equally.
3. Fast, accurate manufacture
   Bevel gears cut by efficient generating method in standard Gleason machines.
4. Assembly control
   Bevel gears adjusted in assembly for control of backlash.
5. Range of Application
   Reductions from approximately 1.5/1 to 2.5/1. Similiar units also used as reverse drives.

Extend these advantages to your drive applications. The Gleason Works, with over 75 years' experience in the bevel gear industry, stands ready to help you. Our engineers will be pleased to aid in designing your planetary gears and in specifying the correct Gleason machines for their manufacture.

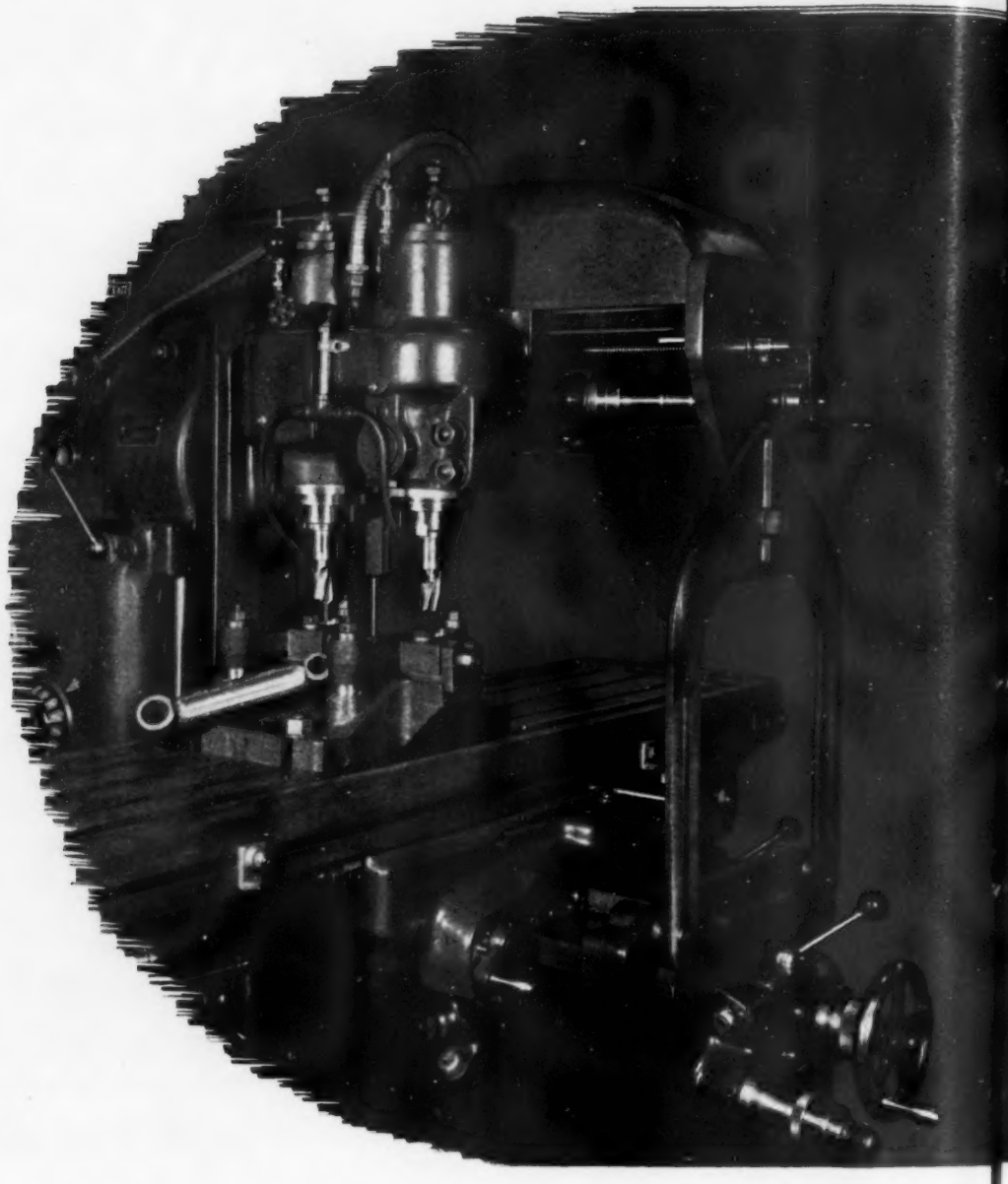
GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

ARMY E NAVY



CINCINNATI

By the simple expedient of adding a two-spindle Vertical Milling Attachment to a CINCINNATI Horizontal Dial Type Milling Machine, two aircraft motor articulated rods are being milled at the same time. With this type of setup, you have a two-spindle vertical attachment on a horizontal miller. The advantage lies in the fact that it virtually gives you two machines in one — a production vertical miller for operations of the type illustrated, and a conventional horizontal type

Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded Feb. 23, 1943.

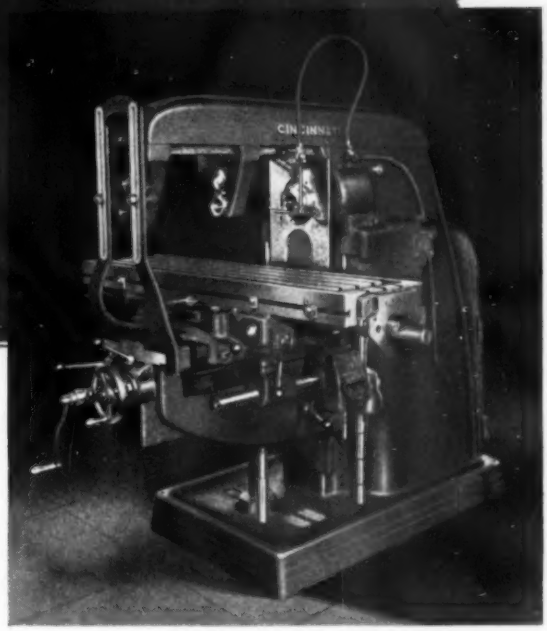
THE CINCINNATI M

MILLING MACHINES

CONTINUOUS PEAK PRODUCTION WITH

CINCINNATI MILLERS

Illustrated at the left is a CINCINNATI No. 3 Plain Medium Speed Dial Type Miller equipped with two-spindle Vertical Milling Attachment and two-station Hand Clamping Fixture. Operation: Rough mill ends of channel and finish mill channel of articulated rods for aircraft engine.



Above: ¾ right front view of a CINCINNATI No. 3 Plain High Speed Dial Type Milling Machine.

milling machine. It has the further advantage of being removable whenever the machine is to be used in the conventional manner. For more complete information write for specification catalog M-970-1. ¶ Perhaps there is a better or faster method of handling some of *your* milling jobs. Why not ask the engineers here at Milling Headquarters? They will be glad to work with you in every way possible. ¶ Sweet's Catalog File gives a brief description of all CINCINNATI Machines.

MILLING MACHINE CO. CINCINNATI, OHIO, U. S. A.

BROACHING MACHINES • GRINDING MACHINES • LAPPING MACHINES

Engraved by H Fernell.

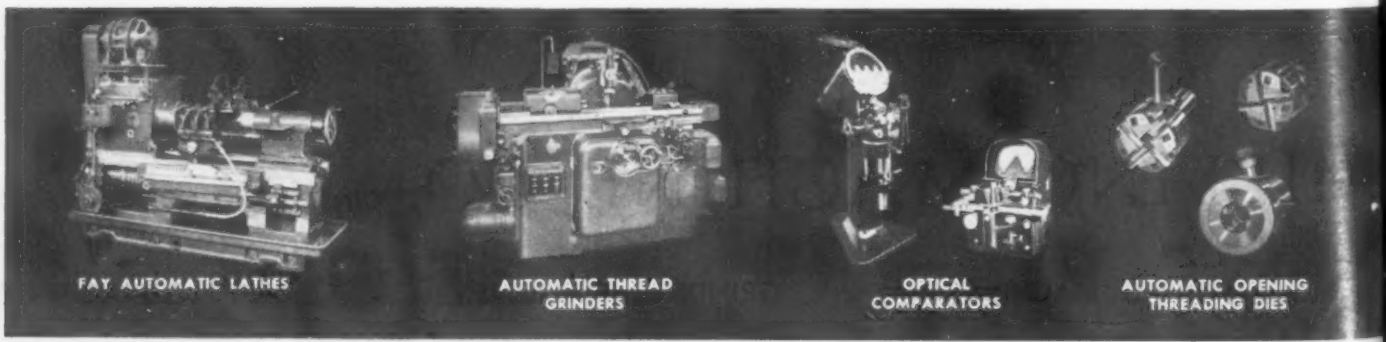
THIS man had a vision. He saw a world in which men would fly through space, and voices could be heard thousands of miles away. A world in which buildings would be many houses high, lighted without lamps, and ascended without recourse to stairs. A world in which machines would do most of the work. . . . And he saw all this made possible as a result of water being heated in a closed container. Standing at the threshold of the age of steam, he had a vision of the future.

Now this man lived in a sane and sensible world, so they beat him with brooms and pelted him with pots, and his final reward for this demented woolgathering was one of the less sanitary cells in Bedlam.

We haven't yet reached the millennium, of course. But we've learned the value of vision. We've learned that it is a divine sort of madness, to be searched for rather than hunted, to be used rather than destroyed.

Today, we're on the threshold of a new age of power — the new Age of Air Transportation — and a handful of visionary men are already telling us what they see in the future beyond this war.

A vision? Yes, but no pipe dream, for the day of world air transport is already in the planning stage.



"Aadman"

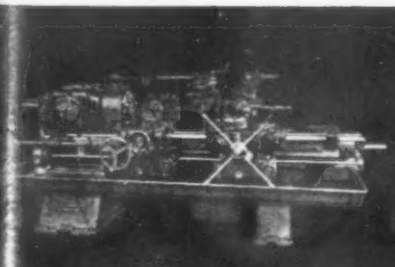
WE in the field of machine tool engineering have had a hand in bringing about the vision of this new age. We helped to make possible the "impossible" mass production of aircraft and engines through an entirely new assembly line technique, known as "fluid production." And today, in close association with the technical visionaries of American industry, we're already at work on production plans for the future.

There is no tool that we cannot build, no job that we cannot do, given the necessity. . . . War was a necessity. So, too, will be peace. . . . We invite you to call upon us now, as the leaders of American industry have been doing for more than a century.

JONES & LAMSON
MACHINE COMPANY

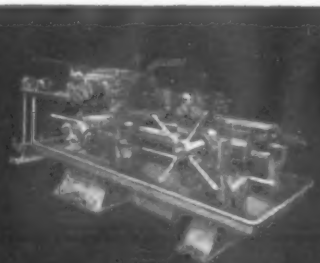
Manufacturers of • Universal Turret Lathes • Fay Automatic Lathes • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies

Springfield, *Vermont,* U. S. A.



SADDLE TYPE
UNIVERSAL TURRET LATHES

PROFIT-PRODUCING
MACHINE TOOLS



RAM TYPE
UNIVERSAL TURRET LATHES

FELLOWS Lap-Finishing

Official Photo U. S. Army Air Forces

WAR PRODUCTION BULLETIN

Stand-up ability

OF WRIGHT AVIATION MOTOR GEARS . . . INCREASED BY FELLOWS LAP FINISHING AFTER TOOTH GRINDING

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTIO

THE FINAL TOUCH FOR FLIGHT RELIABILITY

LS-Type
Gear Lapping Machine

Experience has shown that a final lapping operation after gear-tooth grinding not only produces smoother gear operation, but also increases the life of the gears. The Lapping operation is rapidly accomplished on Fellows LS-Type Gear Lapping Machines at comparative little additional cost; and, the increased life and satisfactory service obtained more than offsets the cost of this additional operation. Fellows LS-Type Gear Lapping is also extensively employed for lapping gears, the design of which precludes grinding of the teeth; thus in some cases gears can be saved, which otherwise would be scrapped. For descriptive literature write: The Fellows Gear Shaper Company, 78 River Street, Springfield, Vermont—640 West Town Office Building, Chicago, Illinois—616 Fisher Building, Detroit, Michigan.

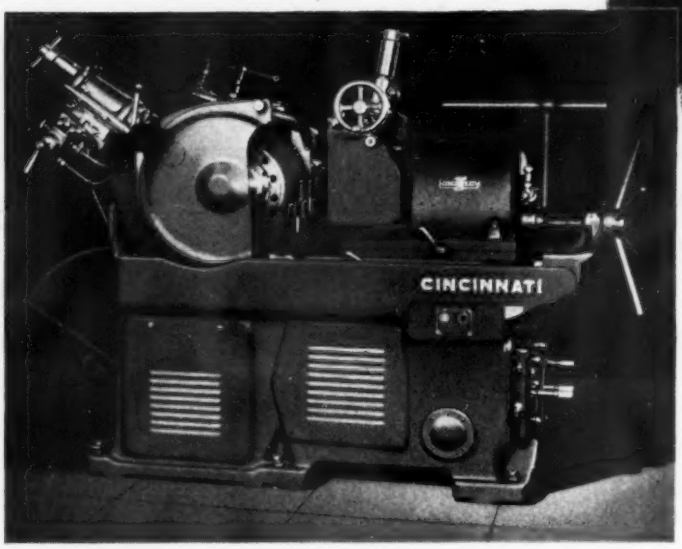
Method

. . . . FROM BLANK TO FINISHED GEAR

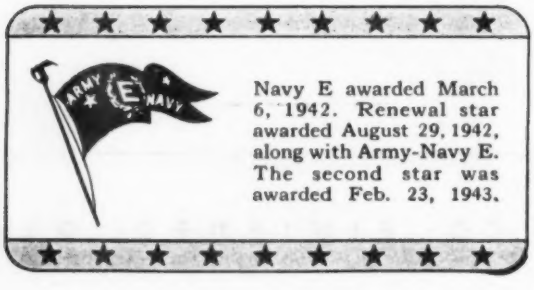
Continuous Peak Production with

CINCINNATI GRINDING MACHINES

Here again the engineers at Grinding Headquarters have materially increased production by devising ways and means of grinding a difficult job by the Centerless method. The machine is a CINCINNATI No. 2 Centerless, equipped with an ingenious work rest and special pusher type loading fixture for grinding the outside diameter of thrust bearing rings for propeller hubs. Loading and unloading was reduced to a fraction of the time previously required. ¶ Cincinnati engineers are interested in your grinding problems, too. Any number of unusual solutions have been worked out which increased production many times over. This group of experts may have exactly what it takes to help boost your production curve. Why not consult them?



Illustrated at the right is a CINCINNATI No. 2 Centerless Grinding Machine. Specification catalog G-456-1 gives complete information on all its features and their benefits. Copy is yours for the asking. Look in Sweet's Catalog File for brief descriptions of all CINCINNATI Centerless and Centertype Grinding Machines.



Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded Feb. 23, 1943.

CINCINNATI

CENTER TYPE GRINDING MACHINES

This special type of loading device stacks the work end to end, thus assuring squareness of the diameter with the previously finished sides. The machine itself, a **CINCINNATI** No. 2 Centerless Grinder, has increased throat distance to accommodate larger diameters. Send for specification catalog G-456-1.

GRINDERS INCORPORATED

CINCINNATI, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

DIFFERENTIAL

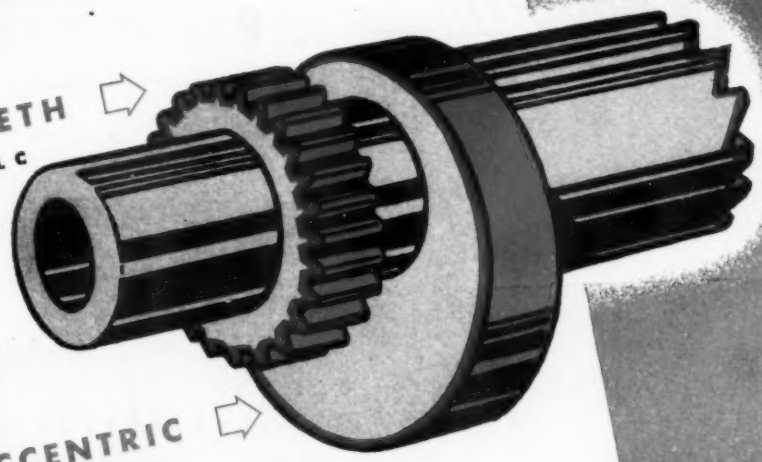
ON THE SAME WORK PIECE IS QUICKLY HARDENED BY VAN NORMAN HIGH FREQUENCY

Typical work-holding fixture and coil arrangement used to harden the clutch teeth. Total hardening operation is completed in 13 seconds.

To harden the eccentric a horizontal-type work-holding fixture is used. Shape of the heating coil follows the shape of the eccentric.

"IT PAYS TO

HARDENING
AND EFFICIENTLY PERFORMED WITH INDUCTION HEATING . . . .



● Since Van Normanizing permits users to heat a specific portion of metal to a predetermined depth, hardening different parts to various degrees of hardness on the same piece is easily and quickly accomplished with Van Norman High Frequency Induction Heating. In the illustration, three different surface hardening operations are performed. Gear teeth are hardened to 54 Rockwell C in 16 seconds; eccentric to 62 Rockwell C in 22 seconds; clutch teeth to 57 Rockwell C in 13 seconds. There is no warping or distortion, and the finished part is free from undesirable scale. And because the entire heat and quench cycle is automatic, finished parts are identical in hardness and physical characteristics.

However, hardening is but one of the many time and cost saving operations performed with Van Norman High Frequency Induction Heating. Other applications include BRAZING, SOLDERING, ANNEALING, FORGING, and MELTING. Find out why *It Pays To Van Normanize* Now. Write for Van Norman Catalog today. It gives a complete story in the uses, possibilities, and advantages of Van Norman High Frequency Induction Heating.

ARMY E NAVY

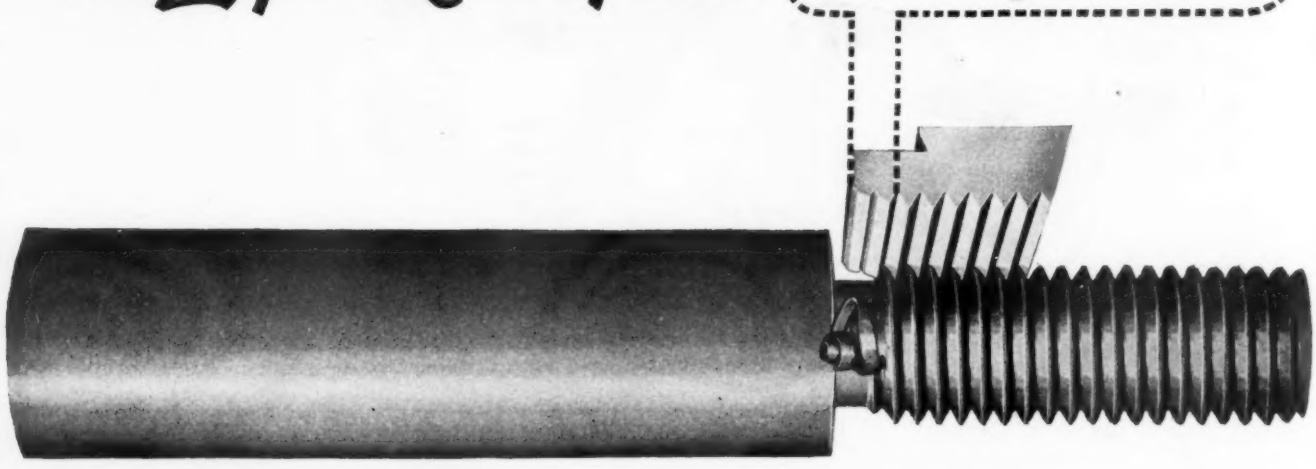
VAN NORMAN MACHINE TOOL CO.

SPRINGFIELD, MASSACHUSETTS

VAN NORMANIZE"

LANDIS CHASERS PERMIT "CLOSE-TO-SHOULDER" THREADING THROUGHOUT ENTIRE LIFE

The Length of Chaser Throat remains permanent



When regrinding the chasers, the entire cutting edge is renewed without increasing the length of the "bevel" or throat. The throat of Landis chasers is never reground. Thus, "close-to-shoulder" threading is permitted throughout the entire life of the chasers.

The cutting edge is always directly on cutting center regardless of the overall length of each individual chaser. The cutting position is not affected by regrinding.

The Finest Thread Cutting Tool in Industry

12 Features of the LANDIS TANGENTIAL CHASER

1–Permanent throat permits close to shoulder threading throughout life of chasers
2–Rake angle range covers all machinable materials
3–Free cutting condition permits maximum cutting speeds
4–Simple grinding operation renews entire cutting edge and leading feature
5–Line contact with work lessens friction and minimizes thread distortion
6–Leading feature insures thread of accurate lead
7–Lateral absorption of cutting strain reduces vibration and chaser breakage
8–Right and lefthand threading feature reduces chaser equipment
9–Standard chasers thread all diameters with proper chaser holders
10–Interchangeability of chasers lowers operating cost
11–Chaser length provides exceptionally long life and low tool cost
12–Permanent throat gives equal distribution of cut

LANDIS MACHINE COMPANY

WAYNESBORO, PA., U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

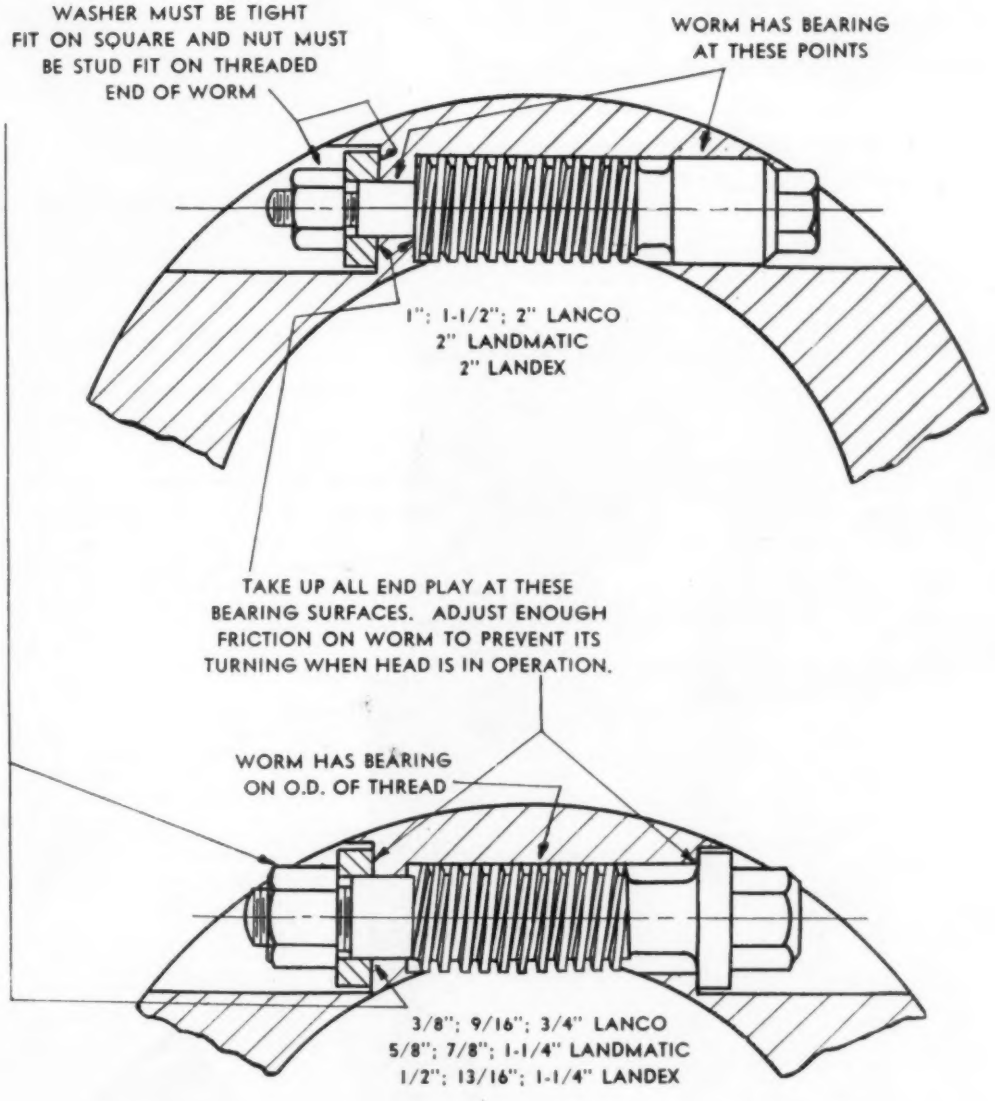
LANDIS REG U.S. TRADE MARK PAT. OFF.

THREAD TIPS

A Good Mechanic Knows and Cares For His Machine

In the Interest of Efficiency, Better Workmanship and Higher Production

Proper Care of the Adjusting Screw of LANDMATIC, LANCO, and LANDEX Heads Helps Eliminate Variations in Pitch Diameter


WASHER MUST BE TIGHT FIT ON SQUARE AND NUT MUST BE STUD FIT ON THREADED END OF WORM
WORM HAS BEARING AT THESE POINTS
1"; 1-1/2"; 2" LANCO
2" LANDMATIC
2" LANDEX
TAKE UP ALL END PLAY AT THESE BEARING SURFACES. ADJUST ENOUGH FRICTION ON WORM TO PREVENT ITS TURNING WHEN HEAD IS IN OPERATION.
WORM HAS BEARING ON O.D. OF THREAD
3/8"; 9/16"; 3/4" LANCO
5/8"; 7/8"; 1-1/4" LANDMATIC
1/2"; 13/16"; 1-1/4" LANDEX

Be Threadwise—Employ LANDIS Long Life Tangential Chasers

LANDIS MACHINE COMPANY
Waynesboro, Penna., U. S. A.

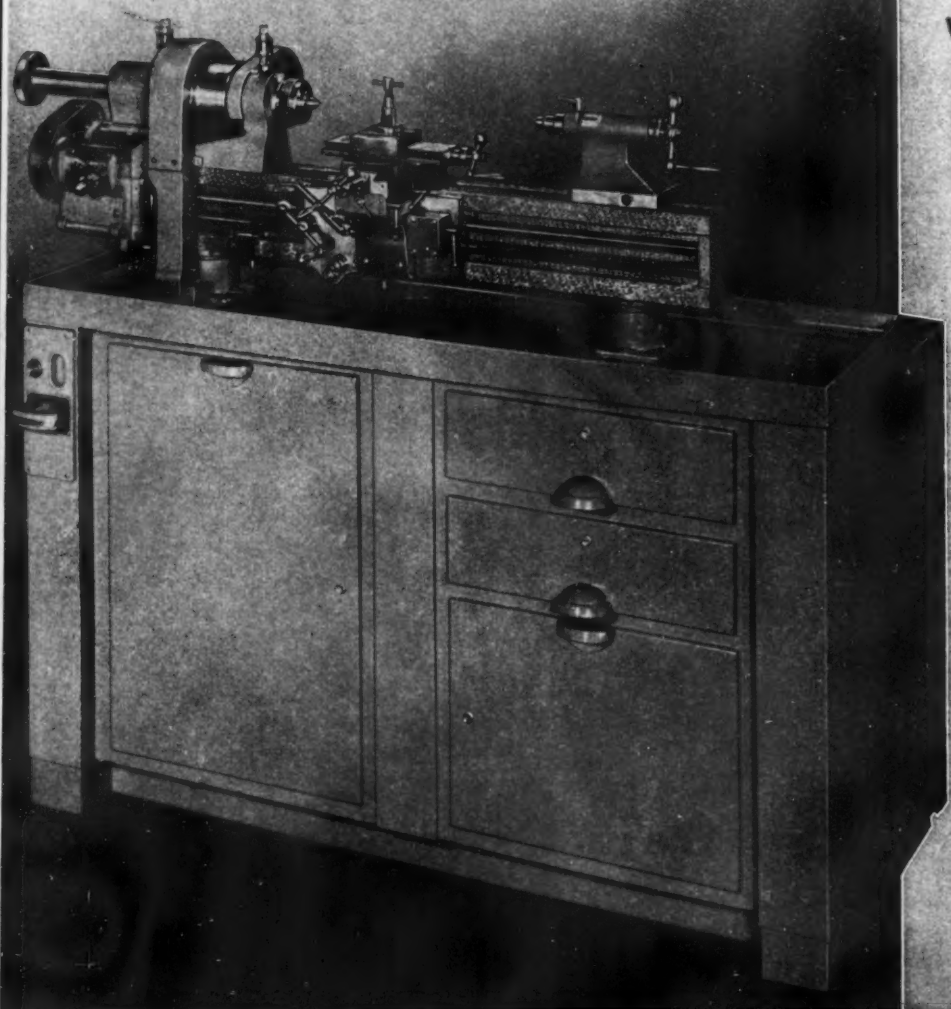
RIVETT

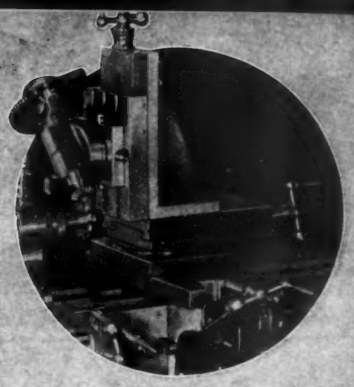
608 WITH VEE BELT DRIVE

In Tool-Making and Instrument Shops It Will Handle Great Variety of Jobs in Minimum Time

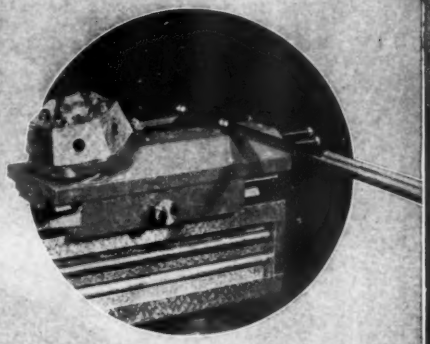
The Rivett No. 608 is a super-precision, back-geared screw-cutting bench lathe designed for fine manufacturing, repair and experimental work. In tool-making and instrument shops it will handle a great variety of parts within the closest precision limits.

Finely made attachments for milling, spiral cutting, slotting, relieving, taper turning, ball turning, grinding, forming and multiple operations enable the user of a fully equipped No. 608 to finish his work completely without recourse to other machines, and throughout his entire series of operations to utilize the inherent precision of the lathe itself.





Milling



Multiple Operations

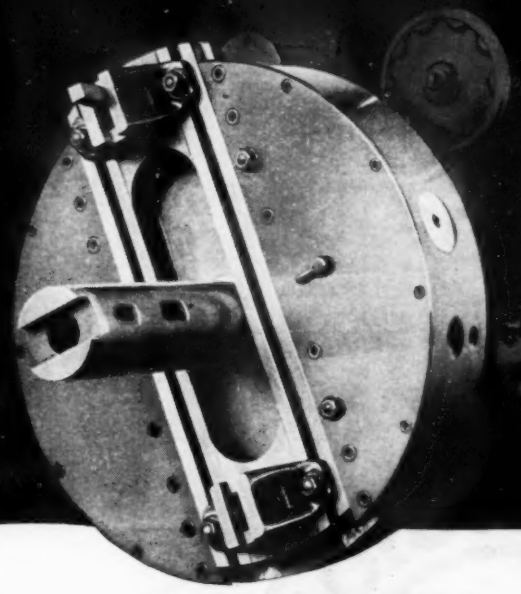
SPECIFICATIONS

With Flat or Vee Belt Drive

Swing over bed, dia.	8½"
Length of bed	40"
Distance between centers	18¼"
Collet capacity, max. dia.	1"
Step chuck capacity, max. dia.	6"
Jaw chuck capacity, max. dia.	6"
Spindle capacity, max. dia.	1⅛"
Slide rest, travel of top slide	5¼"
Slide rest, travel of cross slide	4½"
Feed range, through gear box	.0015" to .0220"
Thread range, through gear box	10 to 144
Tailstock spindle travel	3¼"
Spindle speeds:	
Flat belt drive—12 speeds	39 to 1295 r.p.m.
Vee belt drive—12 speeds	25 to 1500 r.p.m.
Weight of lathe, mounting and drive:	
Flat belt drive, net	900 lbs.
Vee belt drive, net	1050 lbs.

For Further Description Write for Bulletin 608

RIVETT LATHE & GRINDER INC.



Handle more jobs!

on your

G & L HORIZONTAL

with this attachment

Get Increased Flexibility and Multiple Operations on Occasional Turning, Boring and Facing Operations...

Short-run occasional jobs, whose size and shape make them unwieldy to handle on a chucking machine can be bored, faced and turned with this attachment. It is provided with two tool slides with six separate feeds, from .009″ to .118″ per revolution.

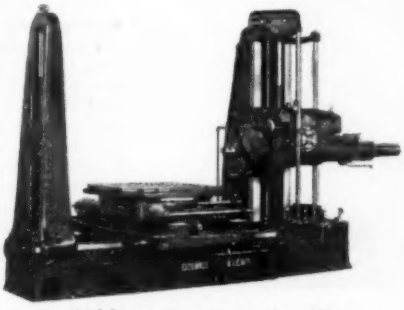
A simple lever controls the direction of feed to the tool slide and a micrometer adjustment for setting the tool slide to .001″.

Removing or mounting the head takes but a few minutes and all adjustments are easily and quickly made.

Increases Flexibility Further When Used With Indexing Table...

Greater versatility can be added to your G & L when using an indexing table in conjunction with the continuous feed facing head. Jobs like large pipe fittings (tees and ells) are easily bored, faced and back faced on all surfaces with a standard machine equipped with rotary indexing table and continuous feed facing head as shown at right.

This attachment will add to the productivity of your equipment or help simplify jobs of the type shown at the right.

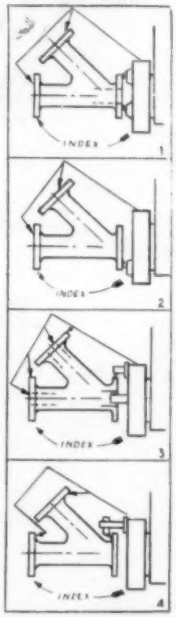


A Giddings & Lewis 340-RT machine with built-in power revolving table and a continuous feed facing and boring head mounted in position.

Speeds Up and Simplifies Operations Like These:

Jobs of this type, which are awkward or impossible to handle on chucking equipment, can be done in a hurry with the G & L continuous feed facing and boring head in conjunction with a G & L rotary indexing table. This fitting, for instance, can be completely machined in *one* setting.

PLAN VIEW



Operation 1
Rough face flange using two tool bits.
Index and perform same operation on other two faces.

Operation 2
Finish face flange using single point tool.
Index and perform same operation on other two faces.

Operation 3
Turn O.D. of flange and bore simultaneously.
Index and perform same operation on other two faces.

Operation 4
Back face flange using single point tool in telescopic tool holder.
Index and perform same operations on other two faces.
Unload.

Additional Data
is contained in this folder. When making inquiry please indicate your business connection and type and size of machine used. Ask for Bulletin No. 62.

GIDDINGS & LEWIS MACHINE TOOL CO.

138 DOTY ST., FOND DU LAC, WISCONSIN

George Grindit Says
"You might compare a multiple V belt drive with a football team or a baseball team. The individual alone is almost helpless. But watch things happen when the whole team is in good condition and working together."
PRECISION
LANDIS
GRINDERS

THE LANDIS
36" - 44" - 50" - 60"
TYPE 30
ROLL GRINDERS

- Recommended for grinding the larger hot and cold sheet and plate rolls with either straight, concaved or crowned bodies.
- Used by steel mills, all of which are turning out practically nothing but steel for war purposes.
- Available in the four swings listed above and in lengths ranging from 120" to 288" between centers.

IF YOU HAVE A GRINDING PROBLEM

Let George do it

LANDIS TOOL COMPANY

IT'S ALL HERE

Chapter IX
MULTIPLE V BELT DRIVES
Those operators who remember the laced flat belt drives of a few years ago are particularly appreciative of the advantages of multiple V belt drives. Even though they function so well on a precision machine such as the grinder, they require attention which they do not always get.
Watch a set of multiple V belt drives in action and you will see that as the load increases the belts dig right down into the grooves of the sheaves and pull all the harder. This suggests several things that should be watched. Always keep the sheaves in line with each other and have each belt in any given set the same size as the others in the set.
Now for a final word about multiple V belt treatment. Don't abuse them. Just like so many other elements of a grinding machine, they demand reasonable care and attention and will reward those who give it to them with long faithful service.
ALL SHEAVES OVER WHICH V-BELTS RUN MUST BE IN LINE.
LANDIS
If there is any question as to the alignment of the sheaves, check with a straightedge. Misalignment, if not corrected, will cause abnormal belt wear.
32

Multiple V belt drives are gluttons for punishment. The more you demand of them, the more they dig in and deliver smoothly and uncomplainingly. That is, they function this way if you treat them right. In case you're not certain what this treatment should be, why not read chapter nine of the book "Better Grinding." You may secure it by mailing the coupon below. The seventeen other chapters on important grinding problems make it the best baker's dozen you ever saw.

THE CHAPTERS

Work Centers and Centers in the Work . . Work Drivers and Driving Dogs . . Work Rests . . The Diamond . . Wheel Dressing and Wheel Truing . . Mounting and Balancing the Wheel . . Grinding Wheel Coolant . . Lubrication . . Multiple V Belt Drives . . Wheel Spindles and Bearings . . Grinding Wheel Feed . . Grinding Wheel Width . . Speed of Work Carriage Traversal . . Work Speed . . Grinding Wheel Speed . . The Grinding Wheel . . Chatter . . Miscellaneous Bits.

Please Send Me a Free Copy of . . .

"BETTER GRINDING"

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ 9

Please Print Above and Send To

LANDIS TOOL CO.

WAYNESBORO, PENNSYLVANIA

WAYNESBORO, PENNSYLVANIA

EVERY SUB COMMANDER KNOWS THE IMPORTANCE OF

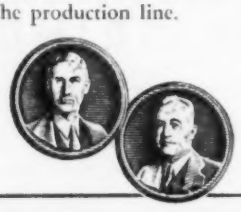
Centralized Control

Instant response — unfailing action in every mechanical element of the ship — is vital to protect the lives of the crew as well as giving striking power to the submarine. From his station, the commander skillfully directs its performance through centralized control equipment.

★ ★ ★

The centralized controls of Milwaukee Milling Machines give the operator complete command of his machine — enable him to control its performance to the fine degree he demands for the full expression of his skill.

Speed and feed dials — all control levers within easy reach — the latter duplicated front and rear on plain and universal horizontal machines (model 2K and larger) — contribute to the sustained precision of Milwaukees, in the tool room or on the production line.



KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WISCONSIN

Buy Victory with at least 10% in War Bonds!

Milwaukee **MACHINE TOOLS**

For *Victory*

and For Your Future...

BUY WAR BONDS AND STAMPS!

Your Home . . .
War Bonds and Stamps provide a good way to save for the home you have always wanted to own.

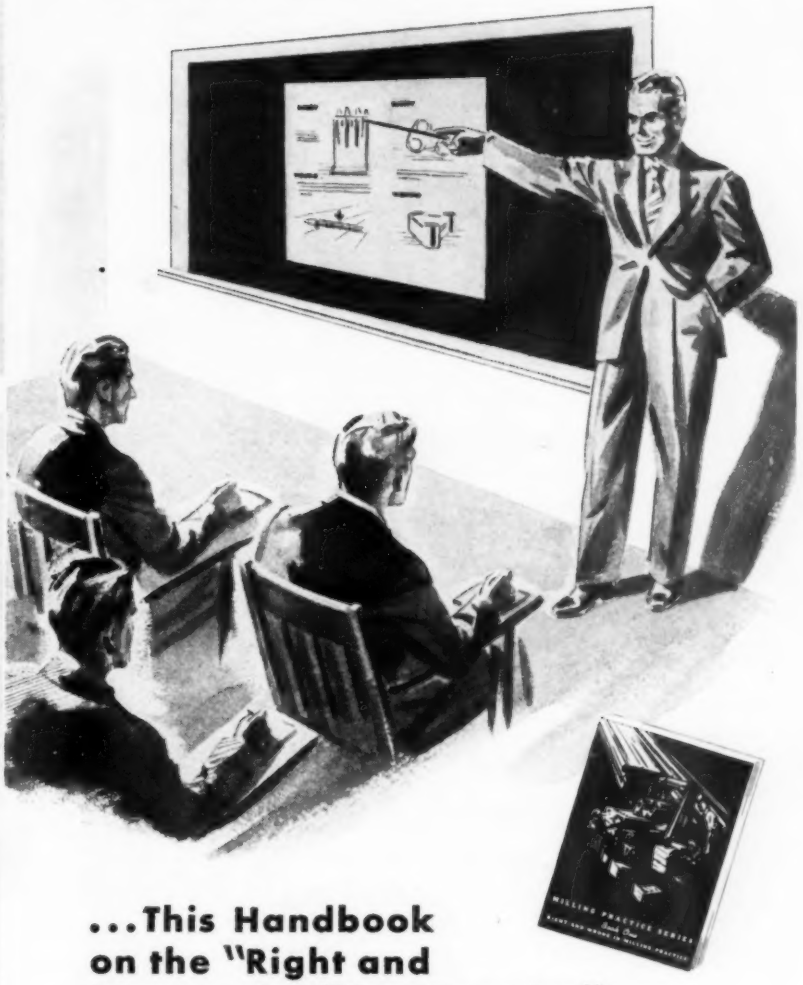
Your Children's Education . . .
War Bonds and Stamps — a good way to lay aside funds for educating your children.

A New Car For Your Family . . .
Save now with War Bonds and Stamps for that new car you will want to buy when the war is over.

V '43 FOR VICTORY

***Buy* VICTORY WITH AT LEAST 10% IN WAR BONDS**

JUST LIKE A LECTURE ON THE FUNDAMENTALS OF MILLING...



...This Handbook on the "Right and Wrong of Milling Practice"

Even experienced milling machine operators find this handbook useful and valuable in brushing up on the fundamentals of sound milling practice.

Written in an easy-to-understand style — contains hundreds of illustrations depicting the right and wrong way of operating a milling machine — plus many valuable suggestions on short cuts in milling — and the correct care and attention of the machine.

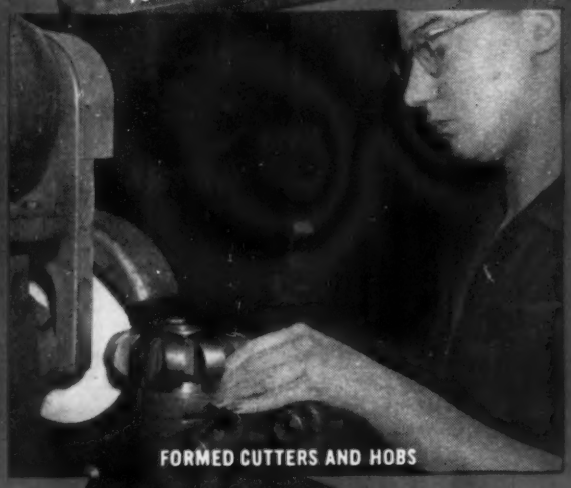
Write for your personal copy of the newest Kearney & Trecker publication, "The Right and Wrong of Milling Practice".

Kearney & Trecker *Products* CORPORATION
MILWAUKEE, WISCONSIN
Subsidiary of Kearney & Trecker Corporation

Kearney & Trecker CORPORATION
Milwaukee, Wisconsin

On these Types of Job[o

with Norton OPEN[T



HAVE you a grinding job where the contact is broad . . . or where the stock removal is especially heavy . . . or where extra coolness of cut is essential? It's on jobs like these that Norton OPEN STRUCTURE Grinding Wheels and Segments can speed war production—making possible heavier and faster cuts.

You will like, too, the *uniformity* of Norton open structure products. This is because the large pores are obtained by a special adaptation of the Norton Contolled Structure process of manufacture —a patented process which assures grinding wheels and segments that have the same grinding action every time.

You may have many jobs for which Norton Open Structure Grinding Wheels are a "natural"—on which they can materially increase production. Let Norton abrasive engineers study your grinding jobs and specify the correct wheels for each.

NORTON COMPANY, WORCESTER, MASS.

Distributors in All Principal Cities

W-922

NORTON ABRASIVES

...ou Can BOOST PRODUCTION
...TRUCTURE Grinding Wheels

NORTON ABRASIVES

One day of battle IN TUNISIA OR RUSSIA

Let us help you motorize your new designs

As a result of today's battle experience, that weapon of war you are producing may call for new motors or generators, or ingenious new motor applications.

In meeting this urgent need, we of General Electric may be able to help you. And the sooner we know your requirements, the greater the chance of meeting them in time.

Right now, G.E. has in production scores of "fighting motors" specially engineered, or adapted, for war machines. It's likely that your requirements can be met by some type of motor now designed and in production. If not, additional production of certain types can be scheduled immediately, or in the very near future.

G.E. has more than 1700 design engineers and application specialists mobilized on motor problems. Among them are men familiar with the electrical requirements

Builder of TRI CLAD Motors

AMPLIDYNES · AIRCRAFT POWER PACKAGES
DYNAMOTORS · GENERATORS
EVERYTHING IN MOTORS

. . shapes next morning's motor needs

of virtually everything that shoots, floats, or flies. By drawing on their experience, your individual needs may be more quickly met.

Every inquiry for "fighting motors" will get prompt and understanding consideration, whether or not we have the facilities available at the moment to serve your particular need. Just get in touch with your local G-E representative. *General Electric Co., Schenectady, New York.*

Typical G-E Fighting-motor Designs

AIRCRAFT "POWER PACKAGE"

Specially engineered to operate such devices as wing flaps, this single, self-contained unit combines motor, reduction gear, and clutch, and other operating elements. It is one of a large family of G-E power packages now in volume production.

MOTORS FOR NAVAL SERVICE

A high production rate is being maintained on motors to drive auxiliary pumps, hoists, and other equipment on naval vessels and cargo ships. G.E.'s familiarity with specifications for these services may help in applying motors to marine products.

DYNAMOTOR FOR TANKS AND AIRPLANES

To meet power demands of communications equipment, G.E. has developed a group of self-contained dynamotors ranging in output from 25 to 600 watts. Their specifications reflect battle experience as applied to tanks, aircraft, and other mobile field equipment.

UNIT-BEARING MOTOR

For small cooling fans on radio equipment and dozens of other wartime jobs, this small motor is compact, quiet, and easy to install. Bearing and core are a single cast member, assuring permanent alignment. Sizes from 1.5 watts to 1/25 hp. Standard type shown here is easily adaptable to various mounting arrangements.

TOTALLY ENCLOSED "TRI-CLAD" MOTOR

For severe service, ½ to 2 hp. This standard totally enclosed motor may have application to your new fighting machines. It has a rotating-labyrinth bearing seal, and leads sealed in compound within the cast-iron frame. Mounting dimensions are interchangeable with those of open motors of like rating.

GENERAL ELECTRIC

The SCHERR TOOL STAND

promotes accuracy, reduces fatigue and saves time on many inspection operations

The OLD way and the NEW

Fine precision workmanship of the Scherr Tool Stand is a counterpart of the high quality of the ATLANTIC SNAP GAGE for which it provides sturdy, convenient support.

As a vise or clamp for holding micrometers, snap gages and other tools, this simple, convenient Tool Stand provides many opportunities to speed up inspection and insure accuracy.

For example by holding micrometers in the Scherr Tool Stand while setting, all possibility of error and distortion due to body heat is eliminated. When used to hold snap gages, the inspector has free use of both hands and therefore can easily handle a much greater volume of work in less time, with less fatigue, and with more accurate results because here again the gage is not in contact with body temperature.

In many shops Scherr Tool Stands with gages are placed on work benches near machine tools so that parts may be quickly and easily checked and inspected after every machining operation.

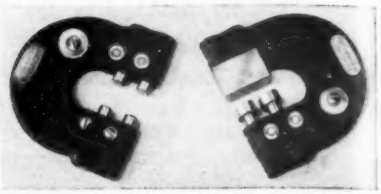
SCHERR TOOL STANDS will pay for themselves over and over again in any shop through time and effort savings and through greater accuracy in inspection.

Order your requirements now. Price $7.50 each.

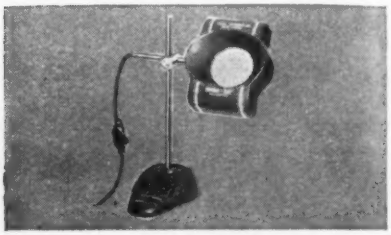
●

A 2" REED Micrometer being held in the SCHERR TOOL STAND for setting and adjusting—an ideal means of supporting micrometer because all chance of body heat affecting accuracy is eliminated.

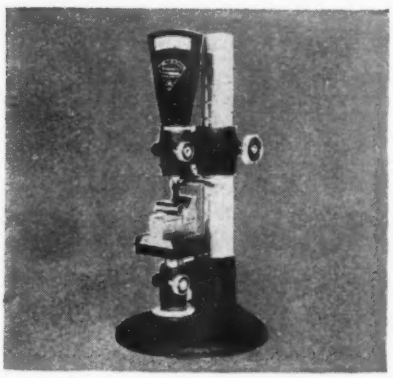
OTHER INSTRUMENTS IN THE SCHERR LIMITED BUDGET INSPECTION LABORATORY



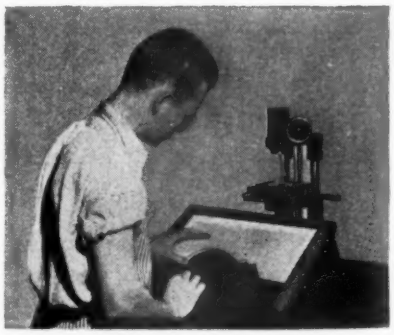
ATLANTIC ADJUSTABLE LIMIT SNAP GAGES provide accurate checkup without having to depend on operator's skill. Sizes to 6".



MAGNI-RAY—a wide-field illuminated magnifier for close inspection of work and operations.

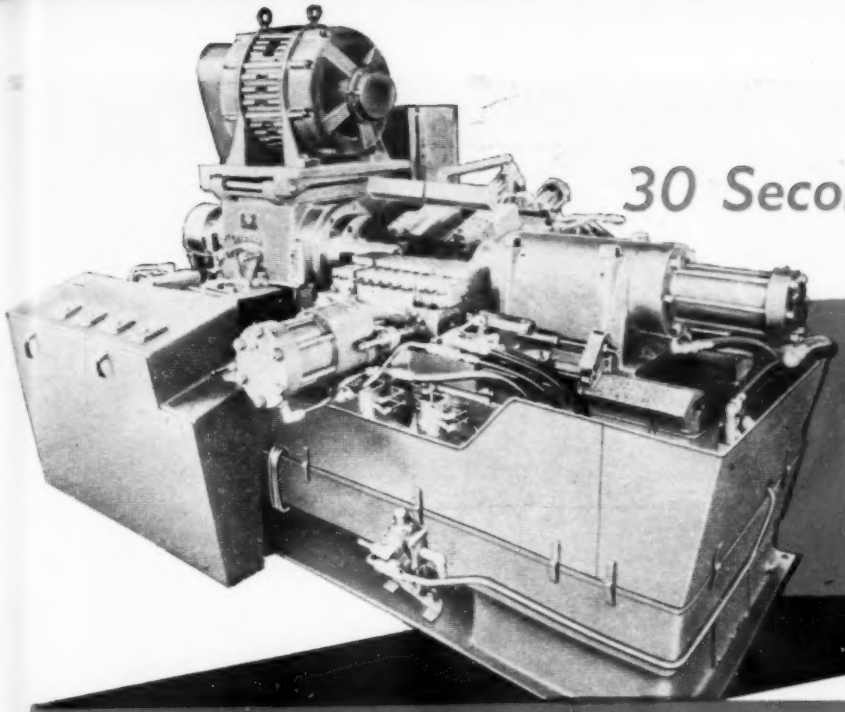


SCHERR COMPARITOL for checking gage blocks, gages and work for size, accuracy and wear.



WILDER PROJECTOR for accurate measuring or comparing objects by means of a magnified shadow image.

GEORGE SCHERR COMPANY, INC. 124 LAFAYETTE ST., NEW YORK, N.Y.



30 Seconds Cutting Time

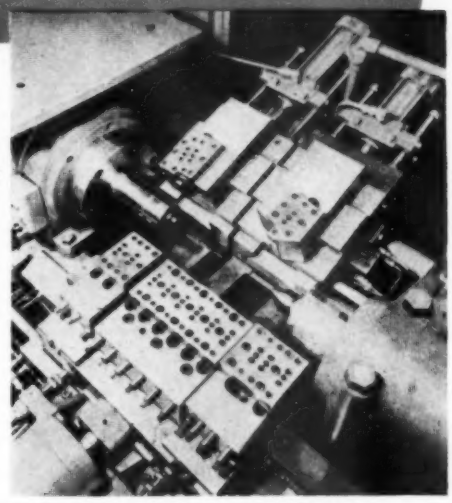
IN ROUGH TURNING 4.7" SHELL

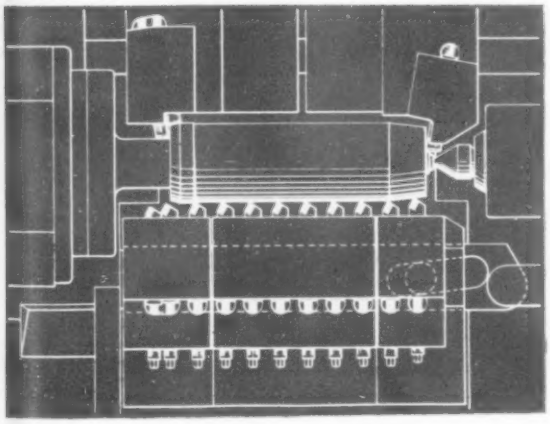
achieved by

MULTIPLE TOOLING

SPARKS SEMI-AUTOMATIC HYDRA-FEED MASS PRODUCTION LATHE

This job is an outstanding example of the tremendous savings which can be made in time and manpower when adaptability to multiple tooling setup is combined with hydraulic control of intricate, interrelated tool movements. In this case Sparks engineers have taken full advantage of these basic features of the Sparks Lathe to achieve mass production in the rough turning of 4.7" shell.





HOW MULTIPLE TOOLING IS APPLIED

Sparks design is such as to permit the development of an unusually effective multiple-tooling set up. Rough turning operations are handled by fourteen tools in all as follows:

11 front tools are employed to rough turn boat tail, body diameters and nose end (remove flange from nose end). Front tool travel is only 1 13/16" to complete cut. The two right hand front tools are cam controlled for turning boat-tail taper.

3 back tools handle base facing, nose end facing and cutting of bevel on nose end respectively.

Length of finished shell is 16⅛". From 200 to 250 shells are rough turned per tool grind using carbide tipped tools.

Average cutting time approximately 30 seconds.

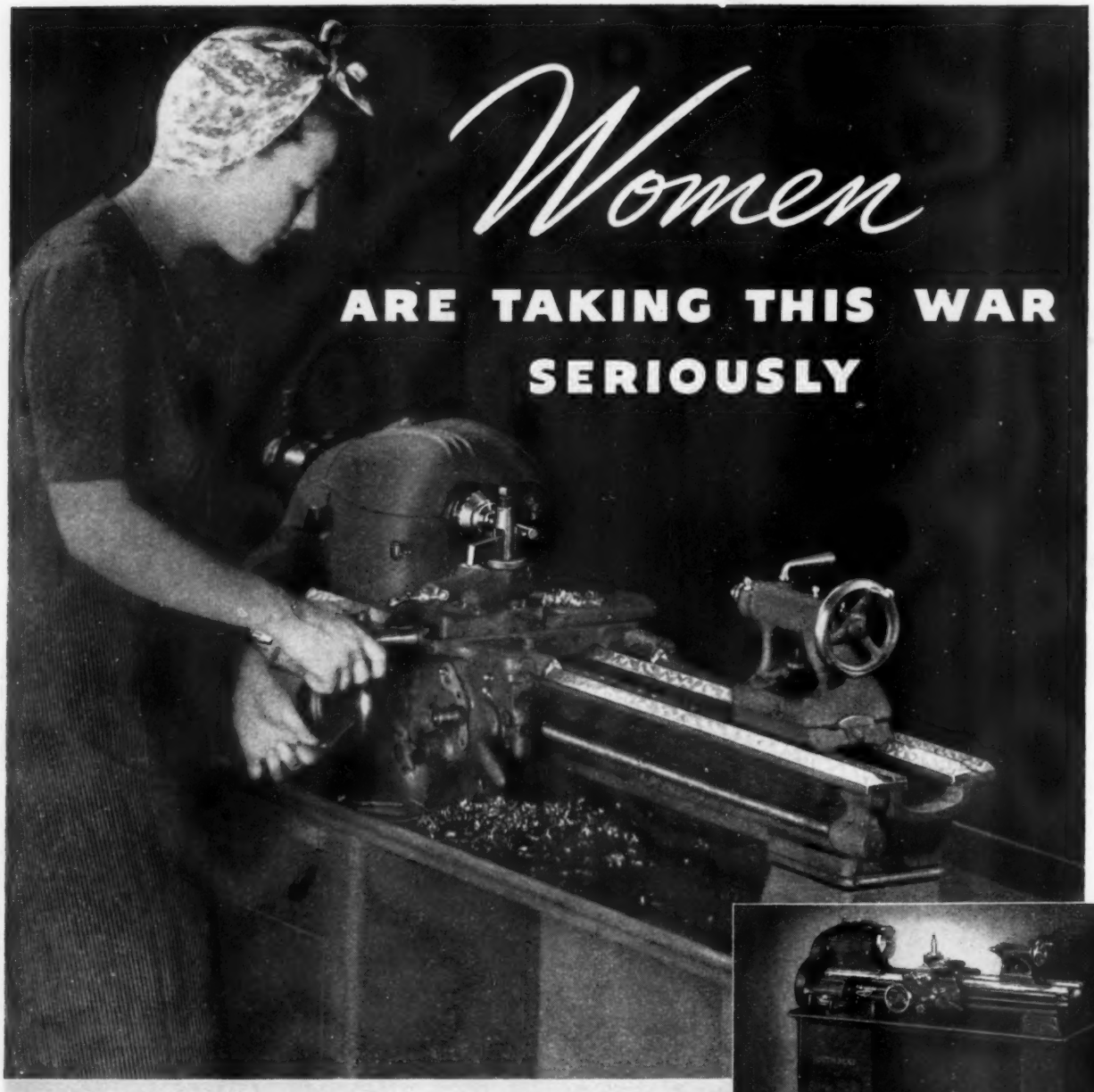
TYPICAL JOBS FOR THE SPARKS

This all-purpose machine tool is equipped with specially designed tooling set up and work holding means for rough or finish turning, facing, grooving, etc. It is adapted to a wide range of mass production work such as shells from 75 m/m to 155 m/m, shell caps, shot bodies, automotive, tank and aircraft engine parts and many others. Investigate today!

SPARKS HYDRA-FEED LATHE

SPARKS MACHINE TOOL CORPORATION

NORWALK . . . . CONN.



SOUTH BEND LATHES

9" swing, South Bend Engine Lathe

With grim determination thousands of American women are doing their best to fill men's shoes. Eagerly they bend their shoulders to wartime tasks—for no sacrifice is too great if it hastens the return of their men from the fighting fronts.

In hundreds of vital war plants, women are operating South Bend Lathes with surprising results. On all kinds of jobs, they have kept up production and maintained established standards of precision. In some factories whole batteries of South Bend Lathes are humming under the guidance of feminine hands.

Since World War I, women operators have preferred South Bend Lathes. Their nimble fingers find the convenient controls well suited to their sensitive touch. They like the fully enclosed design. And, most of all, they appreciate the ease of operation that prevents fatigue and makes the workday seem shorter.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9" to 16" swings, with 3' to 12' bed lengths. The Turret Lathes are made with 9" and 10" swings. Write for Catalog 100C which describes all sizes and types of South Bend Lathes.

BUY WAR BONDS

SOUTH BEND LATHE WORKS

Lathe Builders for 36 Years
SOUTH BEND, INDIANA

Sidney Lathe
PRECISION
meets the close tolerances of airplane manufacture

Easy to hold to infinitely close tolerances—rigid from the base up—smooth flowing power—sum up briefly the inherent qualities of Sidney lathes that adapt them to precision operations demanded in airplane construction.

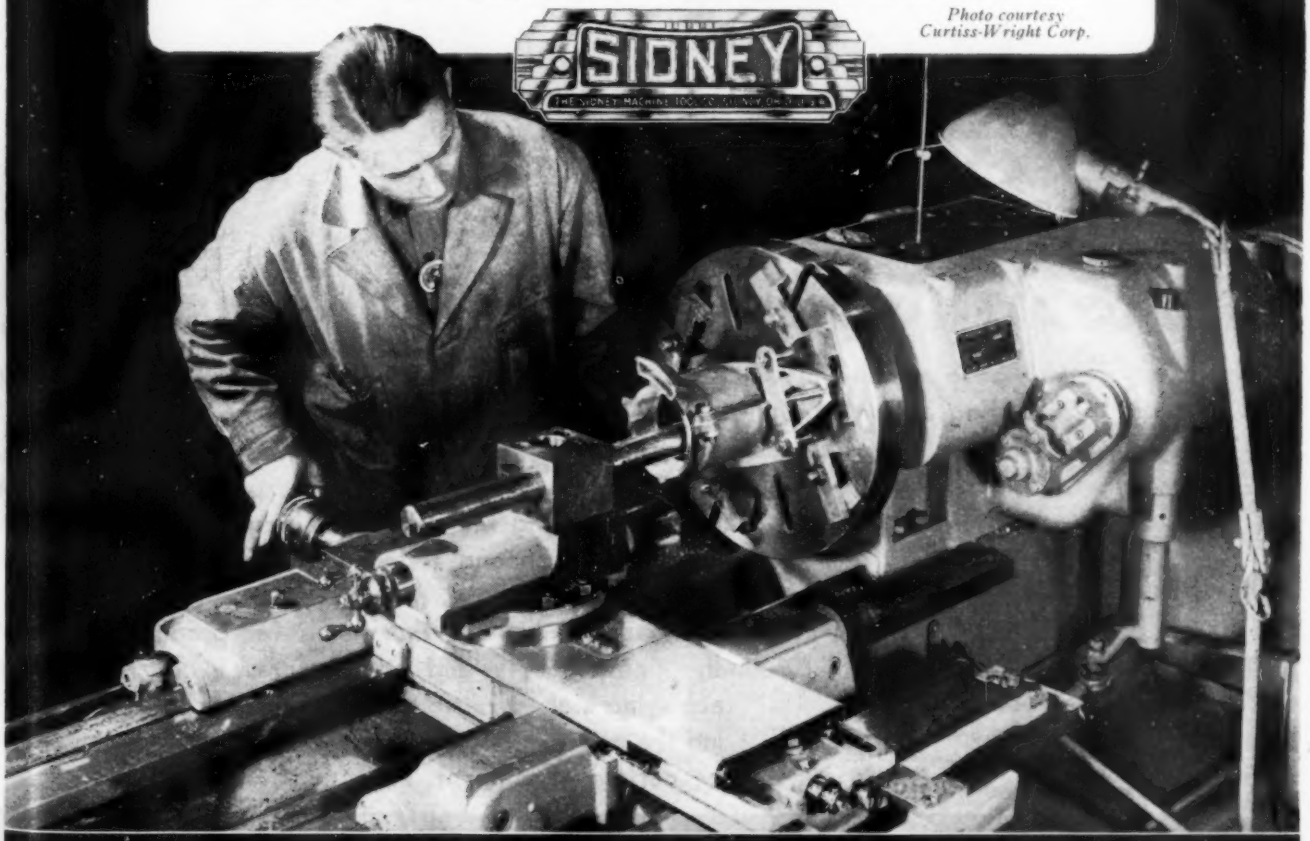
This illustrates but one of the Airplane Manufacturers who are now using not just one machine but batteries of Sidney Lathes on a host of widely different operations.

Your job may not be identical to this but if it calls for sustained accuracy over long periods it may best be done on a Sidney Lathe.

Built in 14" to 36" capacities to cover a wide range of manufacturing applications.

Bulletins available for each model.

Photo courtesy Curtiss-Wright Corp.



The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws—End Mills—Taps—Dies—Screw Plates Profile Cutters—

THE TOOLS YOU BUY AGAIN

Try them on the basis of ASSURED *better performance . . .*

Shop after shop has come to recognize the ruggedness, accuracy and fast cutting action of UNION TOOLS after proving them out on difficult jobs.

There is sound reason for the better performance of these cost cutting tools. One of these reasons is the *experience behind them*—an experience that involves years of research, as well as outstanding technical, metallurgical and manufacturing facilities second to none in the field of small tool production.

Because Union has the means for producing tools of the finest quality and concentrates every resource on achieving highest performance standards on all tools bearing the name "UNION", users of UNION tools can always be certain of efficient, economical service.

UNION TWIST DRILL CO.
Athol, Mass.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 6540 Antoine St.

MANUFACTURING DIVISIONS
S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec
Representatives throughout the world

UNION

ONE OF A SERIES OF SUGGESTIONS TO AID PRODUCTION

You Need a *Special* Oil Here!

WHY NOT GET CRITICAL of the "many-purpose" oil used in your shop? It is as important to get special properties here as in the "single-purpose" oils you so carefully buy. Here are facts in that connection...

FACT: Petroleum research enables Socony-Vacuum to impart *a strong attraction for metals* to general-purpose oil.

FACT: Gargoyle Vactra Oils have this property and their persistent, tenacious oil film resists wiping action and rupture even when film is only microscopically thick.

FACT: These are *specially made* oils of particularly great value in all-loss systems such as hand-oiling, bottle oilers, etc.

FACT: You can depend on Gargoyle Vactra Oils to help minimize wear, power consumption, maintenance, and oil consumption.

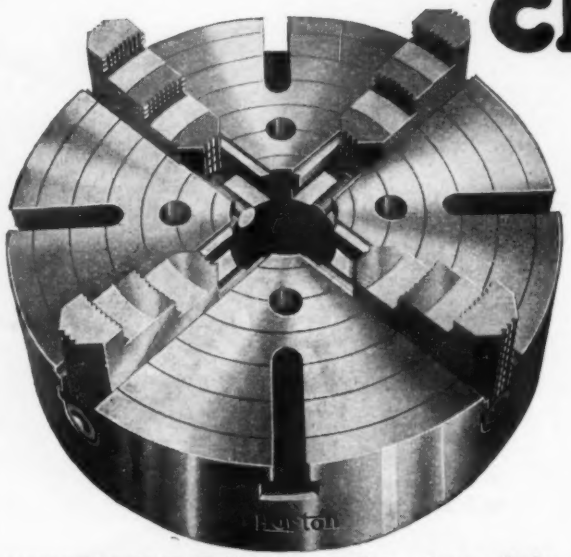
GARGOYLE Lubricants

SOCONY-VACUUM OIL COMPANY, INC. — Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. • Magnolia Petroleum Company • General Petroleum Corporation of California

CALL IN SOCONY-VACUUM

ONE OF A SERIES OF SUGGESTIONS TO AID PRODUCTION

Horton chucks



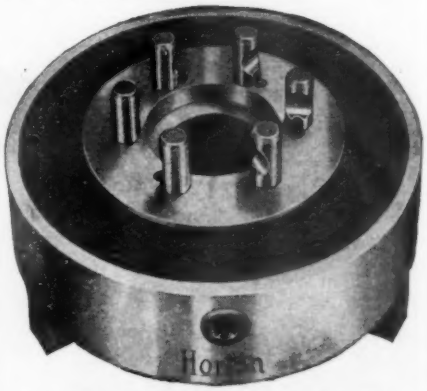
INDEPENDENT Solid Reversible Jaws Only

SCROLL UNIVERSAL Two-Piece Jaws Only

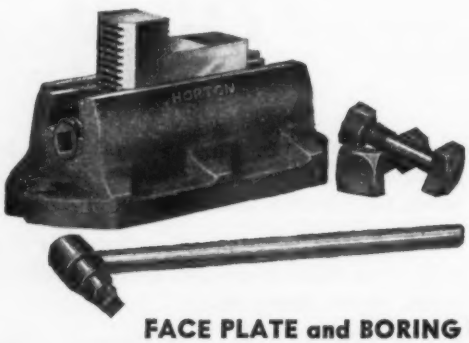
For Use With Intermediate Plates On Threaded Spindles

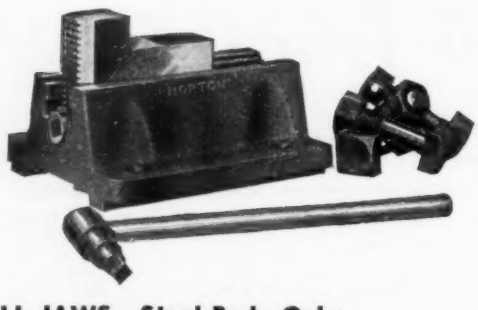
For Key Drive Tapered Nose Spindles

War Production Limited To These Essential Chucks



For Flanged Tapered Nose Spindles
Illustration shows Chuck for Type D (Cam Lock) Spindle





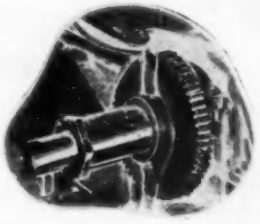
HORTON MORROW

FACE PLATE and BORING MILL JAWS—Steel Body Only

SINCE 1851 .... THE E. HORTON & SON CO.
WINDSOR LOCKS, CONNECTICUT, U. S. A.

New ELECTRIC *air cleaner*

CAPTURES OIL MIST AT ITS SOURCE



Oil coolant mist from high-speed cutting and grinding operations is now whisked out of the air as if by magic. It is eliminated at its source—right at the individual machine tool—by a new application of PRECIPITRON*, the Westinghouse Electric Air Cleaner.

Removal of this oil mist, to be effective, *must* be made at the individual machine. Otherwise, it penetrates through whole departments, adhering to lighting fixtures, bus ducts and wiring. Not only are working conditions made difficult, but a serious fire hazard is created.

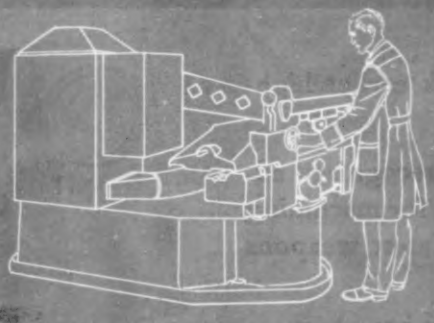
Precipitron solves this problem—and goes still further: It captures the oil mist; then recirculates the cleaned air. The oil removed from the air is *salvaged.*

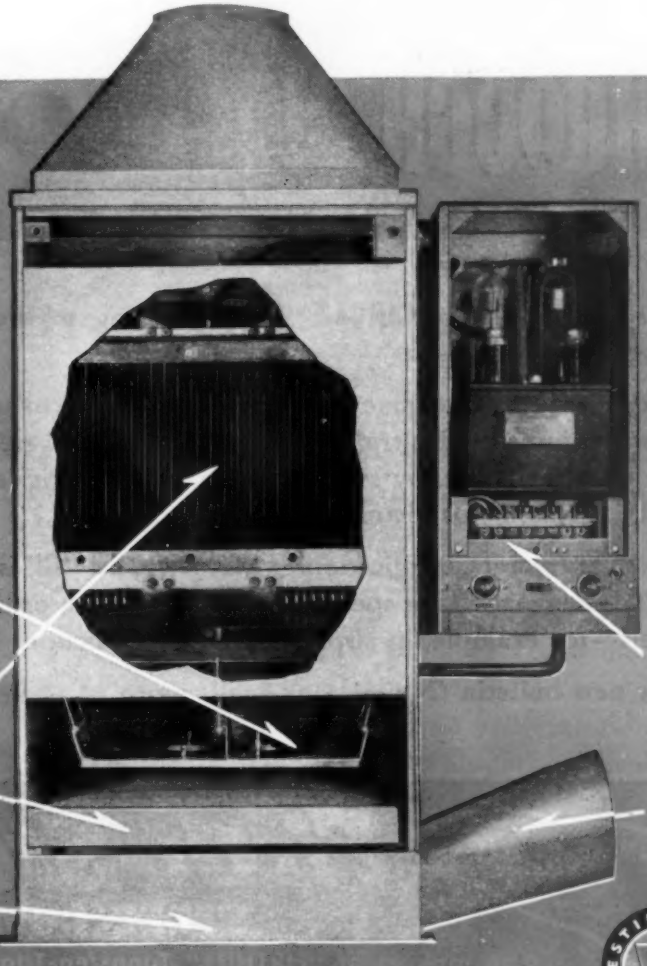
Now available in a self-contained unit for use with individual machine tools, Precipitron thus adds one more job to the many it is doing toward speeding the nation's war effort. Because it cleans the air electrically and is able to capture more than 90% of ALL particles down to 1/250,000 of an inch in diameter, it has brought a new meaning to industrial air cleaning.

For full information, get in touch with your nearest Westinghouse Office. Or write Westinghouse Electric & Manufacturing Company, Edgewater Park, Cleveland, Ohio, for booklet B-3267.

*Trade-mark registered in U. S. A.

TUNE IN JOHN CHARLES THOMAS, NBC, SUNDAYS, 2:30 P. M., E. W. T.





An electrostatic field at the front of the Precipitron Cell charges all dust, dirt and oil particles as they enter.

Charged particles are drawn to, and precipitated on, these Collector Plates.

Mechanical filter removes large metallic and abrasive particles.

Drain at bottom of unit permits oil to gravitate back to the oil reservoir.

Power Pack provides d-c voltage to set up the electrostatic field, and also energizes the Collector Plates.

Air duct from machine tool (or tools), through which oil-laden air enters unit.

WESTINGHOUSE

Westinghouse Precipitron

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

Electronics at Work

SEE MORE PRODUCTION

THROUGH CIRCLE "C" SUPER HIGH-SPEED STEEL

In shop after shop, **CIRCLE "C"** is helping to break earlier high-production records.

Today's grim war-demands have revealed hitherto unrecognized advantages in using this truly **"SUPER"** high-speed steel for machining the tough, hard, alloy steels that go into America's latest weapons and equipment for victorious warfare.

There are definite applications where **CIRCLE "C"** is yielding at least 25% faster machining speeds, as compared with ordinary high-speed steels—for example, in airplane-engine production.

The new bulletin (No. SL-2005) tells more.

Send for
BULLETIN SL-2005

ARMY E NAVY

Firth-Sterling
STEEL COMPANY

Also makers of "FIRTHITE" Tungsten-Titanium Carbides for steel cutting

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

One way trip...to death!

A DEVASTATING MIGRATION occurs at irregular intervals in Norway. Countless hordes of rodents, known as "lemmings," emerge from nowhere. They seem to be led by some invisible Pied Piper.

They travel in parallel lines three feet apart, straight through hay and corn stacks, across mountains instead of around...on and on to the brink of the sea. But they don't stop there. They swim straight to a point miles out in the ocean. Then they swim in circles until they drown!

Several theories have been advanced about the fatal pilgrimages of lemmings, but the most likely one is that they are searching for an island which no longer exists. It is an age-old custom: blindly attempting to live by landmarks which disappeared long ago.

The custom is represented by men who hooted at automobiles—by the men who laughed at Wright—and by the men who said democracy couldn't compete with a dictatorship. Happily, those men can be belied by a reliable index—that of the machine tool industry.

We gave Germany a 7-year head start, and passed her in about a year. For every one machine tool produced today by the Nazis, **we are now producing 5.**

The Conomatic, a key machine of peacetime industry, is well known to the production men of America. Those with their eye on the future are already thinking in terms of peacetime production—after victory is won—with Cone Multiple Spindle Automatic Lathes.

CONE Automatic Machine Company, Inc., Windsor, Vermont

FOR QUICK KEMPSMITH SERVICE-- REACH FOR YOUR PHONE

KEMPSMITH DISTRIBUTORS

Akron, O.	Strong, Carlisle & Hammond Co.
Baltimore, Md.	Calco Machinery Co.
Boston, Mass.	Wiggelsworth Machinery Co.
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Montreal, Que.	Moore Bros. Machinery Co., Ltd.
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Windsor, Ont.	Rudel Machinery Co., Ltd.

There is a KEMPSMITH *Distributor Near You!*

If you want to tool up your milling machine for increased production, just phone the Kempsmith distributor nearest you. Kempsmith Distributors everywhere are ready to serve you and you'll find their engineers both capable and willing to help solve your machining problems.

The Kempsmith Machine Company is proud of its distributor organization. Selected on the basis of location, engineering skill, service facilities and broad technical experience, Kempsmith distributors are a vital force in the industry. Every one is a well-established, reliable concern—the kind of firm with which you like to do business.

THE KEMPSMITH MACHINE CO. • Milwaukee, Wisconsin, U. S. A.

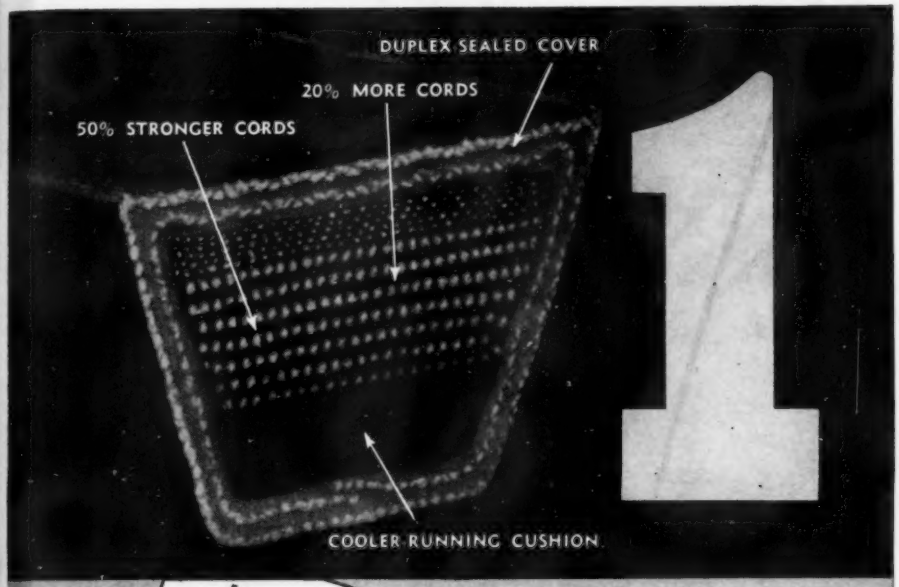
KEMPSMITH

• Precision Built • Milling • Machines • Since 1888 •

Slab Milling Job on a Kempsmith Type "G" Machine.

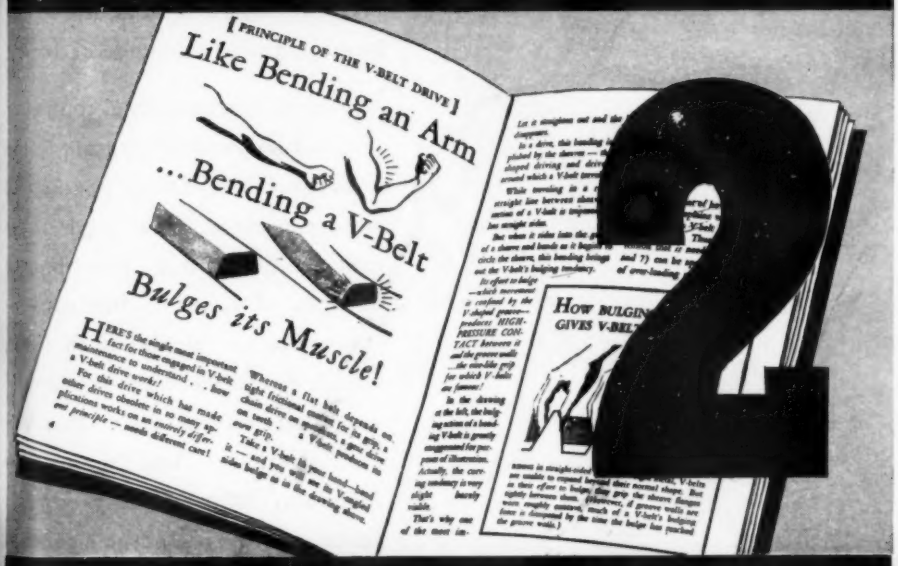
Milling Circular Table Slots on a Large MAXIMILLER.

PUT THE Brakes on V-Belt Wear (DO IT TWO WAYS)



1 BUY THE BEST BELTS. .

You'll find design-against-wear at its finest in Texrope Super-7 V-Belts! 20% more pulling cords — each *50% stronger*, thanks to the New Flexon Process — combat stretching, give Super-7's extra power and durability. Cords are eased around sheaves on a shock-absorbing cushion of special cool-running rubber that combats flexing heat, enemy of V-belts. Tough, new Duplex-Sealed cover protects inner belt structure. When you do need new belts, *invest in the best* — Texrope Super-7!



2 USE THE BEST CARE. .

Whatever brand of V-belts you are now using, you can make them last *longer* by following the tips in Allis-Chalmers' free handbook: Plain Facts on Wartime Care of Rubber V-Belts." Typical contents: how V-belt anatomy affects maintenance . . . good rule-of-thumb for tension . . . seven dead V-belts and what killed them. Packed with practical data, fully illustrated, the new handbook is specially suited for training new men. Tear off the coupon below and send for this valuable new handbook today!

ALLIS-CHALMERS

TEXROPE* SUPER-7 V-BELTS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

Trade mark registered U. S. Patent Office. Texrope Super-7 V-Belts are the result of the cooperative research and design genius of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by Allis-Chalmers. Available in all sizes

ALLIS-CHALMERS MFG. CO.
Milwaukee, Wisconsin

Gentlemen:

Yes, I would like to receive free of charge a copy of your "Plain Facts on Wartime Care of V-Belts".

_____ (Name)

_____ (Title)

_____ (Company)

_____ (Street Address)

_____ (City and State) A-1605-9

VAN NORMAN operating controls are

always right at the operator's hands

Specifications:
No. 2S Horizontal Knee-type Miller.
Table: 50" x 12".
18 Speeds: 25 to 1250 rpm.
18 Feeds: 3/8" to 32".
Range: 28" longitudinal, 10" cross, 18" vertical.

Whether the operator is at the front or rear of a Van Norman Miller, the directional controls for all power feeds are always right at hand. This Van Norman feature enables the operator to do more accurate work since he can position himself at the point where he can best watch the progress of the cut. In addition, front and rear directional controls eliminate unnecessary operator movement thus reducing worker fatigue thereby increasing production and accuracy.

Add to this, the directional control of the feed levers which operate in the direction of desired table, saddle and knee movement... the single lever feed selector that provides 18 changes of speeds... the conveniently located spindle clutch lever, adjustable to the most convenient operating position... and other Van Norman design and construction features... all combined to provide faster, accurate and economical milling with both new and old operators.

VAN NORMAN MACHINE TOOL CO.

SPRINGFIELD, MASSACHUSETTS

"It pays to Van Normanize"

TRADE-MARK

Thompson

REG. U.S. PAT. OFF.

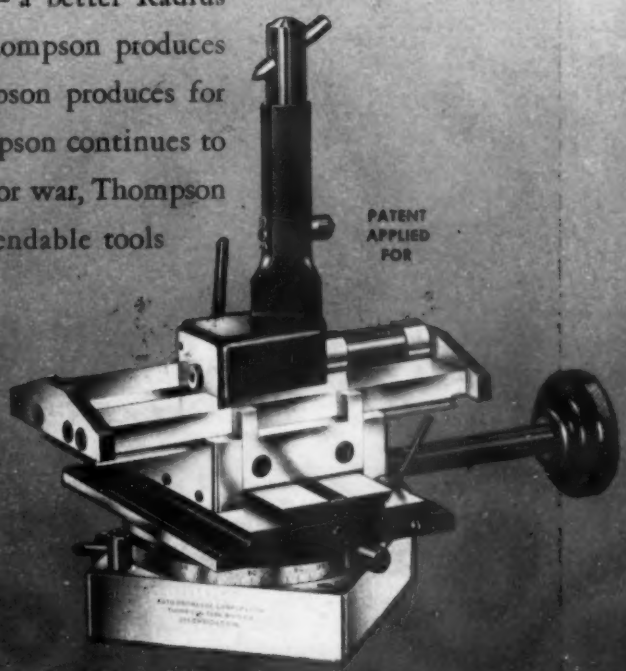
Announces a New

UNIVERSAL

Radius Dresser

Again Thompson produces — a better Radius Dresser — precision made. Thompson produces for our armed forces—Thompson produces for our production forces—Thompson continues to produce and improve. In peace or war, Thompson will show the way with dependable tools — produced on time.

Write for further information on this New Thompson Universal Radius Dresser

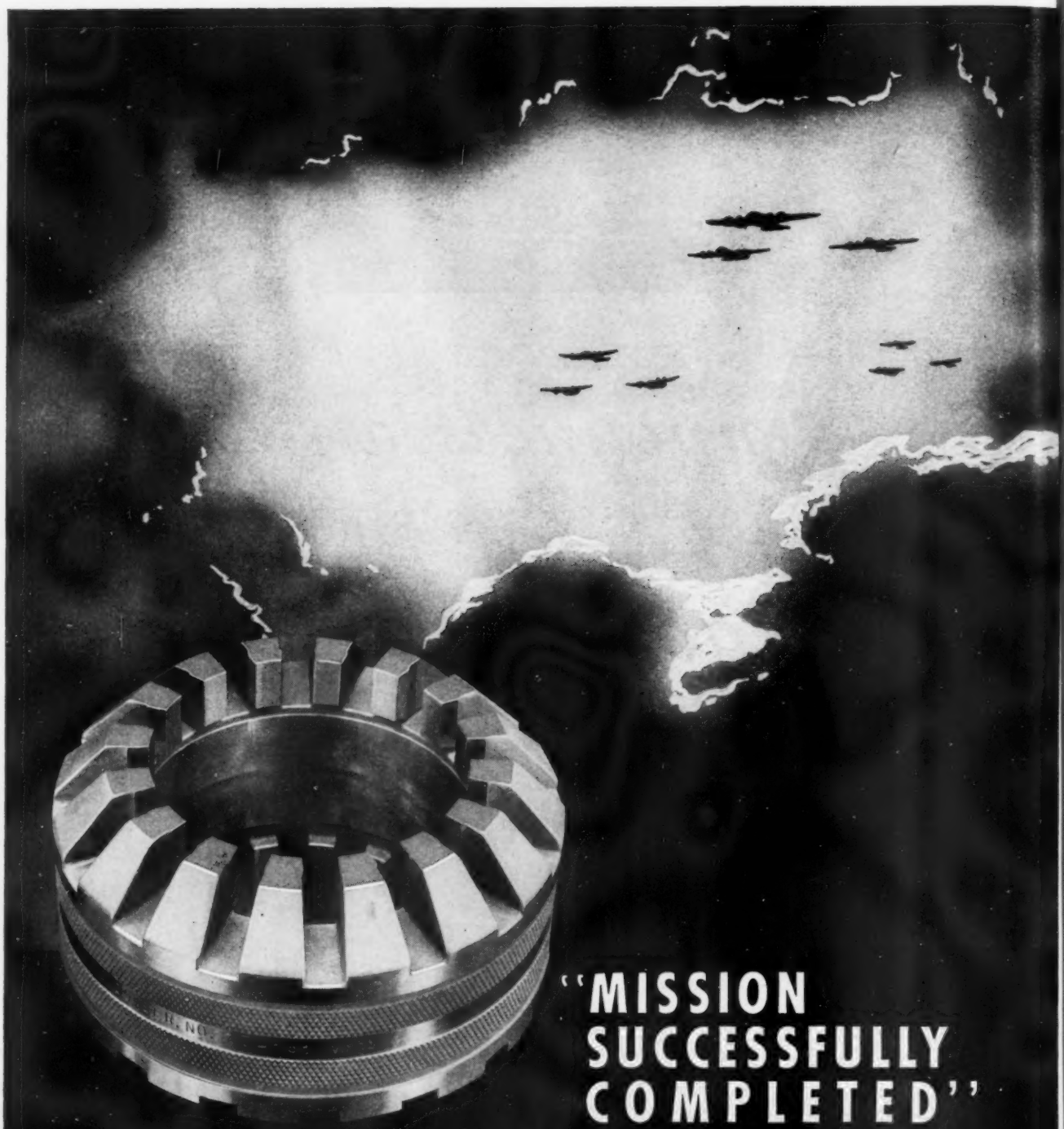


ARMY E NAVY

Awarded to Auto-Ordnance Corporation for excellence in production of "Tommy" Guns.

AUTO-ORDNANCE
CORPORATION
THOMPSON TOOL DIVISION

342 WEST PUTNAM AVENUE, GREENWICH, CONN.



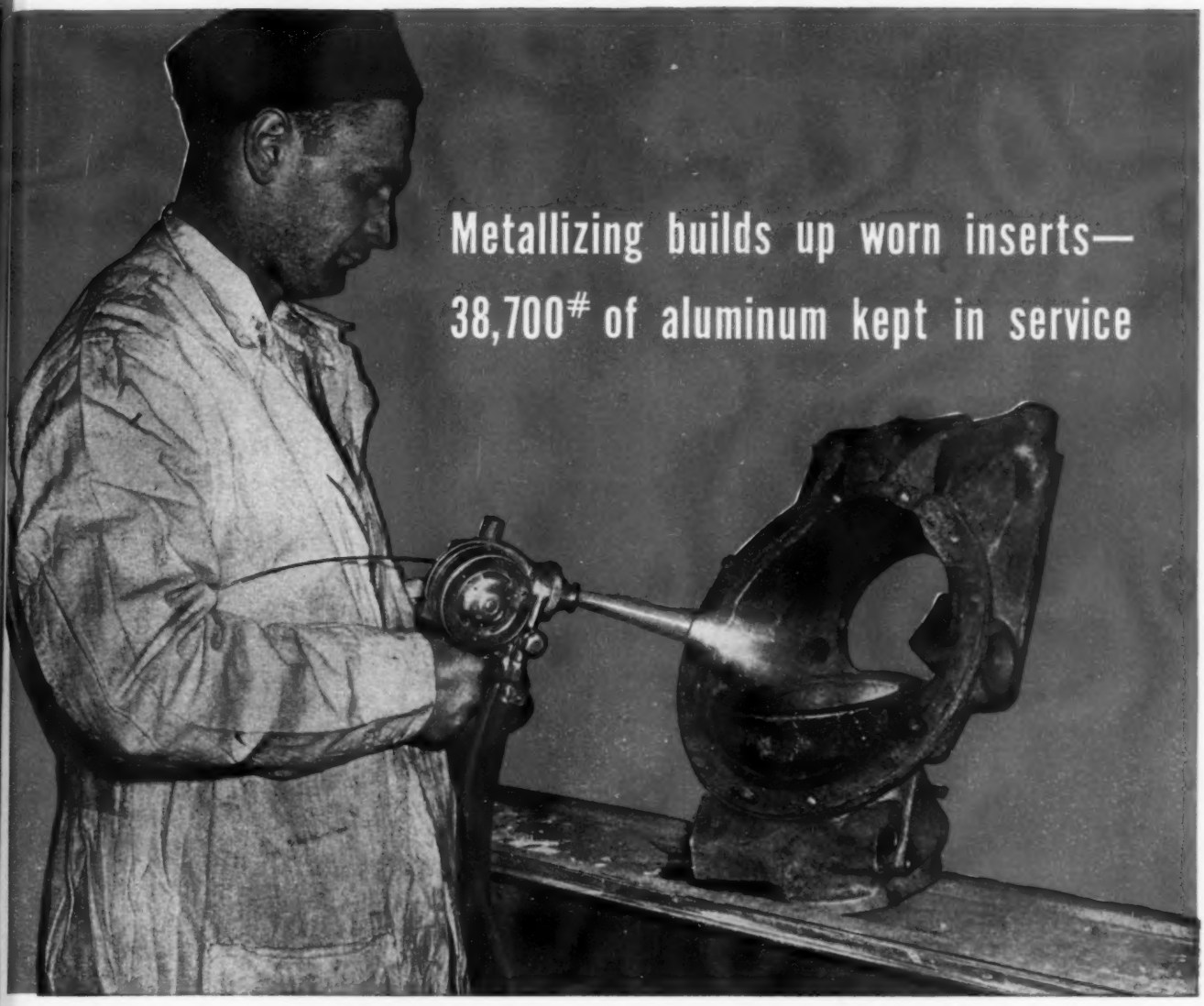
"MISSION SUCCESSFULLY COMPLETED"

Short, snappy hops to flatten submarine bases on the coast of Occupied France—block-busting visits to Essen and Cologne—softening operations on Bizerte and Tunis—cracks at Jap fields in New Guinea and Kiska—Shangri-la raids on Tokio—all of these use planes, planes and more planes! The almost 7000-plane-per-month production here in the U. S. would not be possible without those "production multipliers," those "precision inspectors"—GAGES. . . . VINCO is making thousands of gages for use in the rapid production of planes.

VINCO CORPORATION

8851 SCHAEFER HIGHWAY • DETROIT, MICHIGAN

MILLIONTHS OF AN INCH FOR SALE BY VINCO



Nine hundred of these 43-pound aluminum housings were salvaged in a year's time by building up their worn, iron inserts by metallizing. The large amount of precision machining that would be required for finishing new castings was avoided. The old bearings were re-used, and the reworked assemblies gave more service than originally.

Thus the war effort is being aided by conservation of materials and labor, and the continuation in service of hard-to-get equipment.

The iron insert in this housing is subjected to severe thrust from the gears, so it must be anchored solidly. This is taken care of by casting it integrally with the aluminum housing. Building up a worn insert by metallizing does not disturb this security, nor does the work reduce the high strength of the aluminum. The added metal is bored out and the original bearing put back in place, ready for additional months of service.

Perhaps there's a cue here on means of maintaining *your* hard-working aluminum alloy equipment. Had the aluminum part of this assembly been worn, it, too, could have been salvaged by metallizing with aluminum. Alcoa engineers will gladly advise you on methods of doing this. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

CLEVELAND UNIVERSAL IN SOLVING YOUR

MANPOWER PROBLEMS of modern production, be it on munitions or "civilian goods" are more than mere questions of how many men you can get and how many hours they can work.

There are the more intricate problems of time savings on each operation on every machined part you produce. There are the problems of giving each man *the power to produce more,* both for the assembly line and for himself. These are the problems that Clevelands help to solve, not merely because they are fully automatic, but, further, the exclusive universal camming feature of Clevelands greatly reduces the time required for set-ups and adjustments.

Every operation on a Cleveland Single Spindle Automatic is controlled by standard cams. Immediate settings close to the final limits are made possible by a universal adjustment feature with which tools can be swiftly readied for the processing of any job within the wide scope of the machine . . . and when a setup is made, the Cleveland speed of production, on multiple operations, is such that savings commence within a very few pieces after the run starts. That's another reason why Clevelands have a wide reputation for . . .

1 **Maximum sustained production on *long runs,* with minimum down time for adjustments.**

2 **Profitable economy on *small lot, short run jobs.***

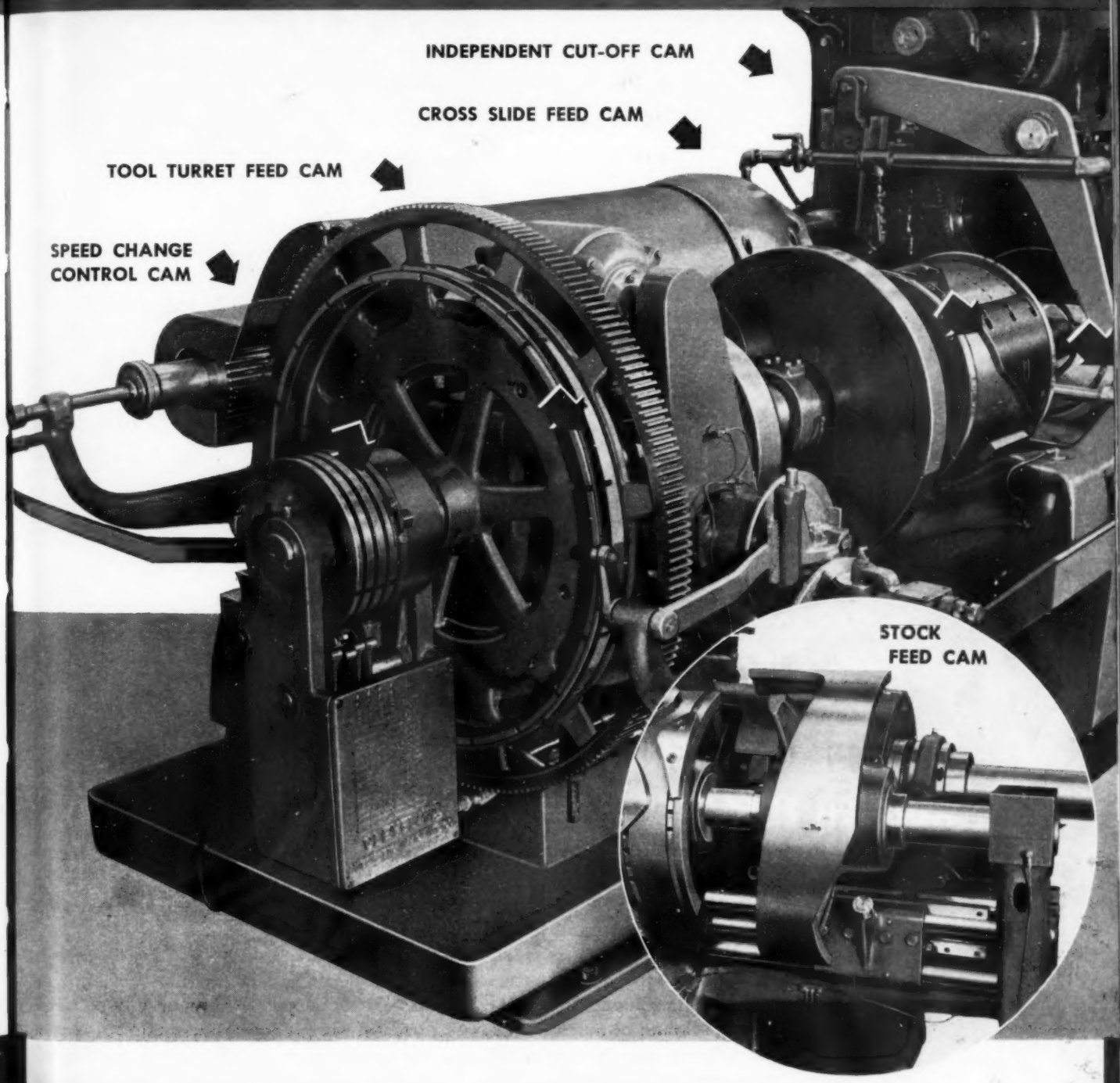
JUST REMEMBER, CLEVELANDS CUT COSTS

CLEVELAND *Single Spindle* AUTOMATICS

MODEL A—Built in 1 1/16-inch to 9 1/2-inch capacities inclusive

MODEL B—Built in 1 1/16-inch to 2 1/2-inch capacities inclusive

CAMMING HELPS MANPOWER PROBLEM



THE CLEVELAND AUTOMATIC MACHINE COMPANY

CLEVELAND, OHIO

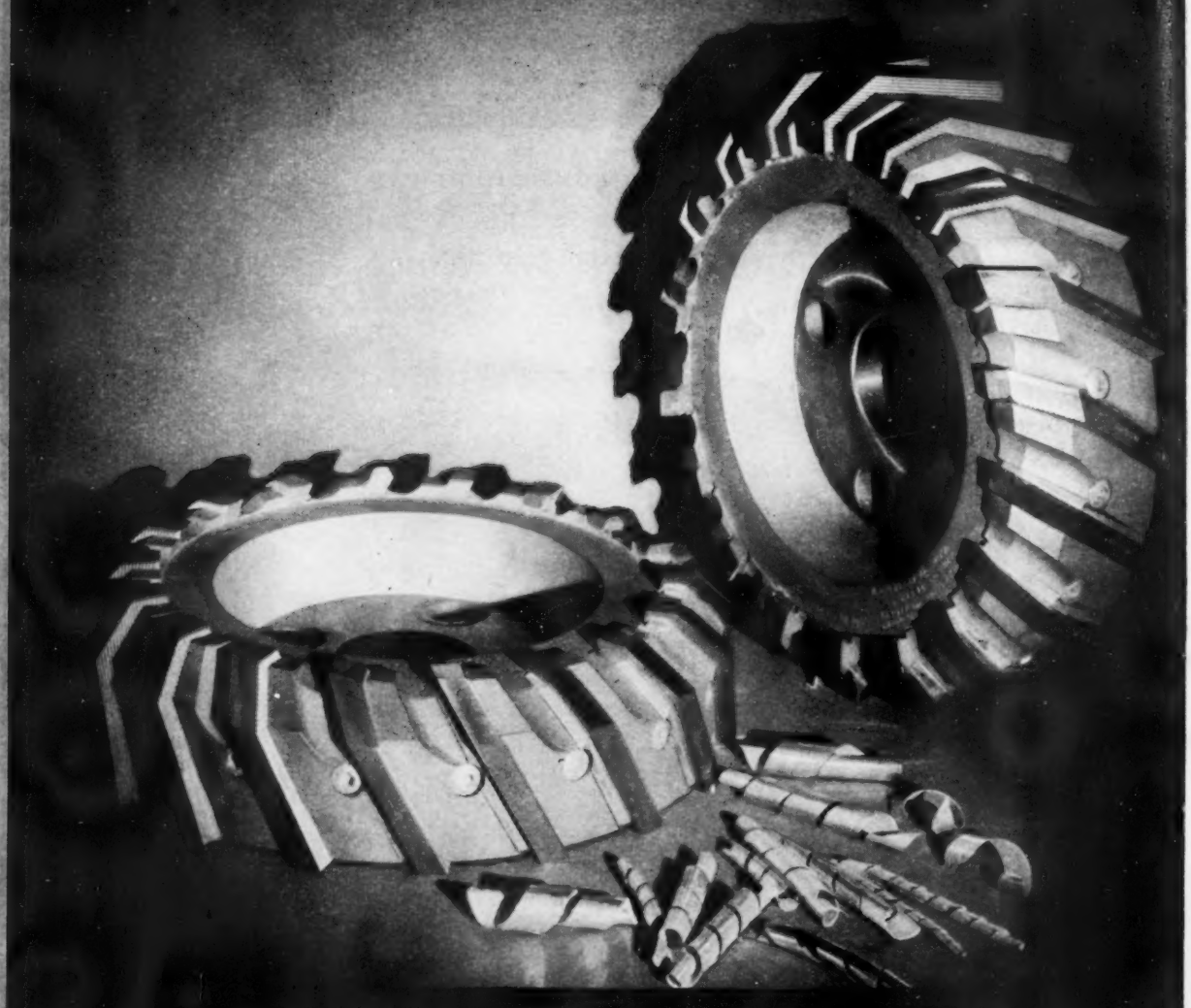
SALES OFFICES

CHICAGO: 20 North Wacker Drive, Civic Opera Bldg., Room 1408

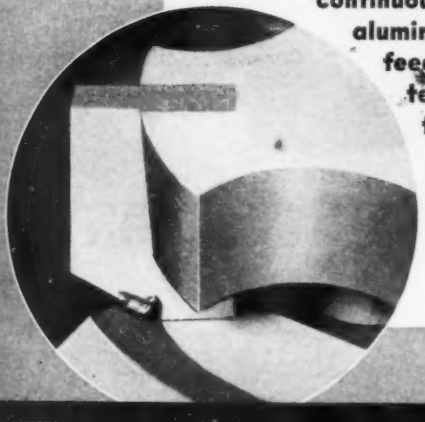
NEWARK: 902 American Insurance Bldg.

DETROIT: 540 New Center Building

INGERSOLL SHEAR CLEAR



SMOOTHER FINISH FASTER FEEDS
LONGER TOOL LIFE LESS POWER REQUIREMENT



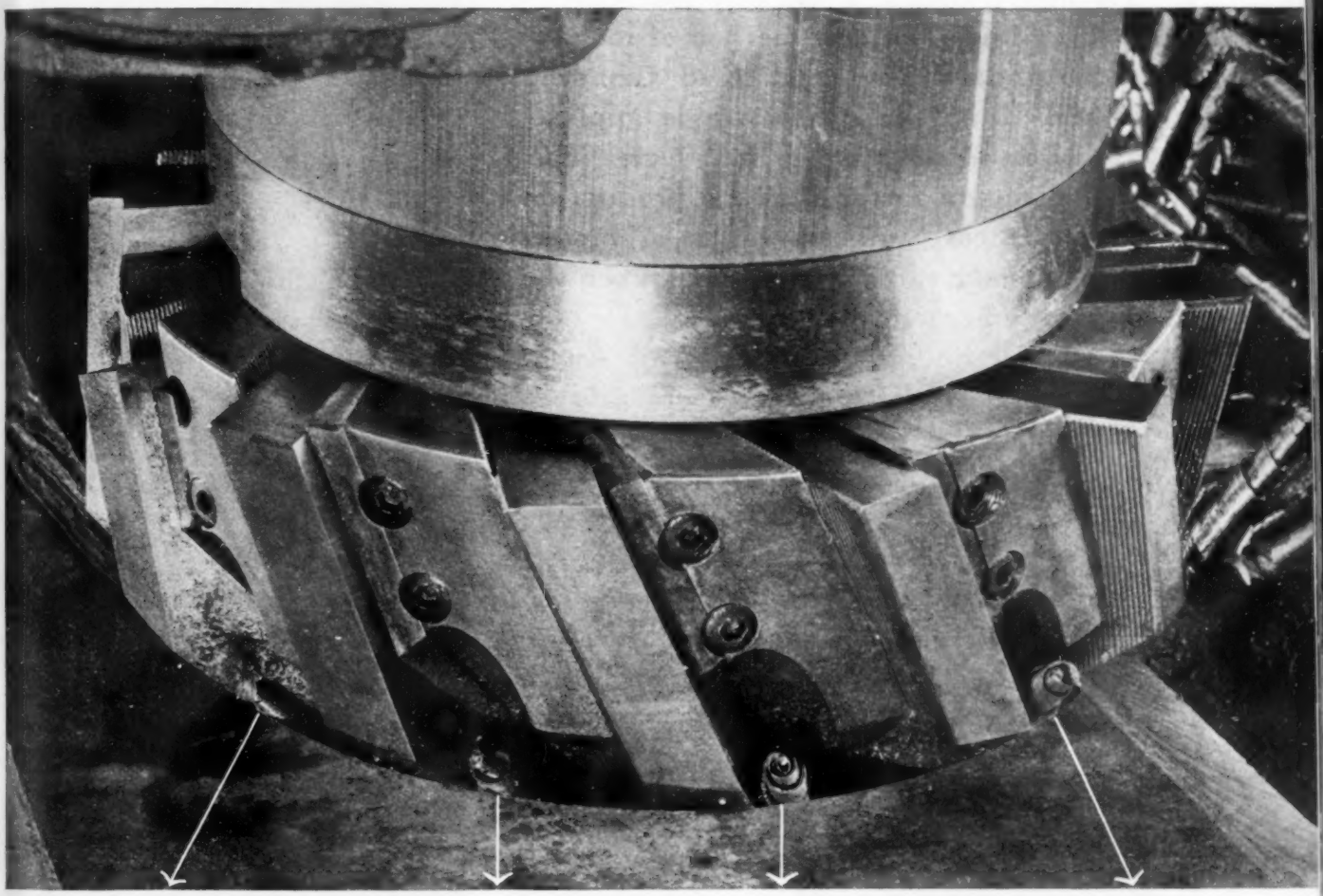
The new Ingersoll SHEAR CLEAR face mill is a patented milling cutter designed to cut continuous chip materials such as steel, aluminum and copper at increased feed rates. Some Shear Clear cutters are feeding as much as ten times the former feed rates of conventional face mills. This cutter also produces a smooth milled surface by directing chips outward away from the finished surface. Often this eliminates a finishing cut.

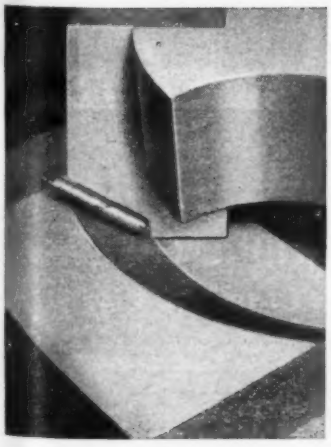
Blades are set in the housing at negative rake and steep positive shear angles. The corners of the blades are chamfered. Actual cutting is done on this bevel portion of the blade which reduces impact load of blade entering work (See insert). This cutting action extends blade life between grinds and reduces power requirements.

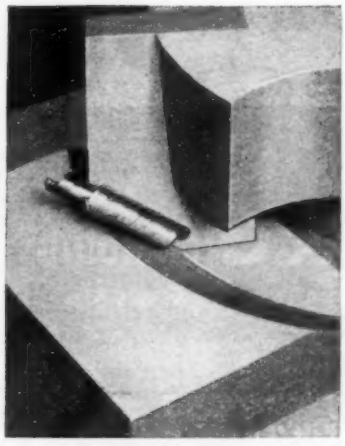
A NEW DEVELOPMENT IN FACE-MILLING

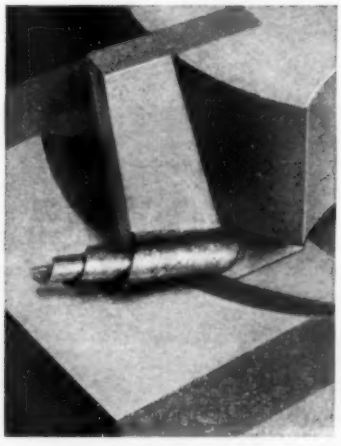
This action picture shows the new Ingersoll SHEAR CLEAR face mill taking a deep cut in steel and the models below illustrate how Shear Clear chip is formed.

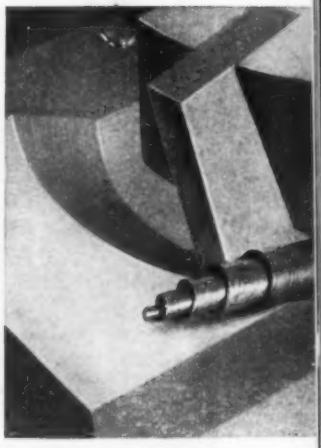
Note how chip is forced to coil out along the blade away from finished surface and is thrown clear of cutter at end of cut. This eliminates packing of chips in face of cutter, permitting higher feed rates and preventing scoring of finished surface.











THE INGERSOLL MILLING MACHINE CO. ROCKFORD, ILL.

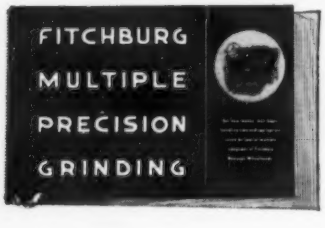
WHAT ABOUT *TOMORROW'S GRINDING COSTS?*

You can cut tomorrow's costs with the Fitchburg Grinders you buy today.

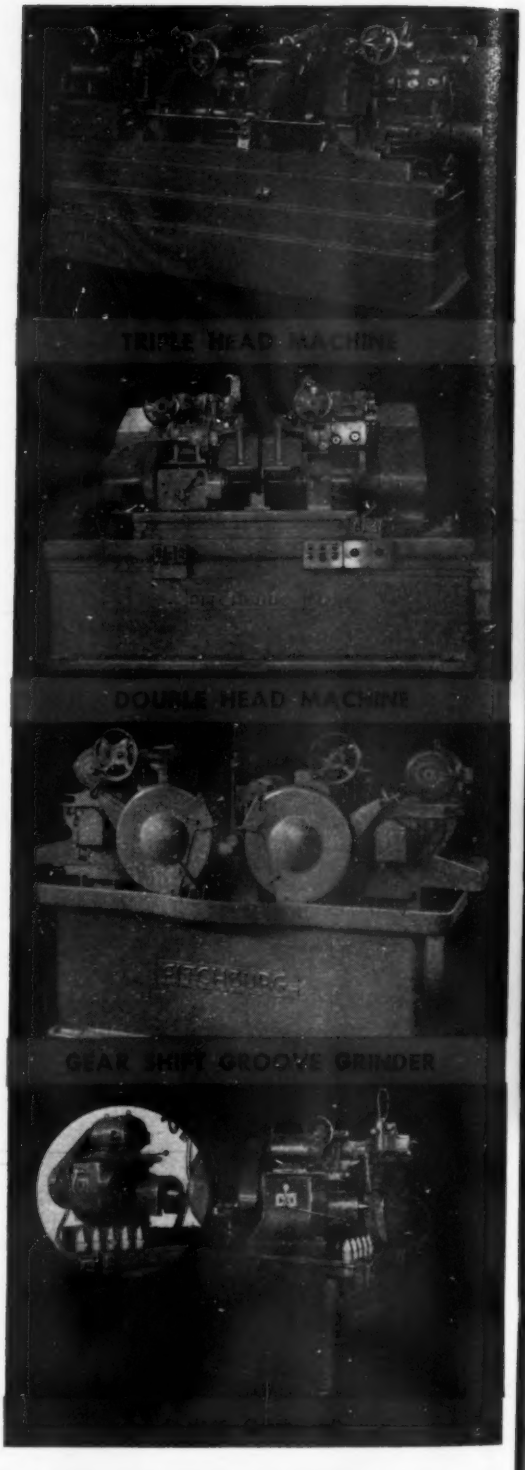
Fitchburg low cost method of mounting standard Bowgage Head Grinding Wheel Units for special single applications, or to multiple grind special jobs, will give you faster wartime production at lower cost, and leave you in a position to make rapid changeovers when the present emergency is over.

All Fitchburg Bowgage Head Automatic Precision Grinding Wheel Units are standard. They can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.

Save time and money — speed up cylindrical production grinding with Fitchburg Bowgage Heads.



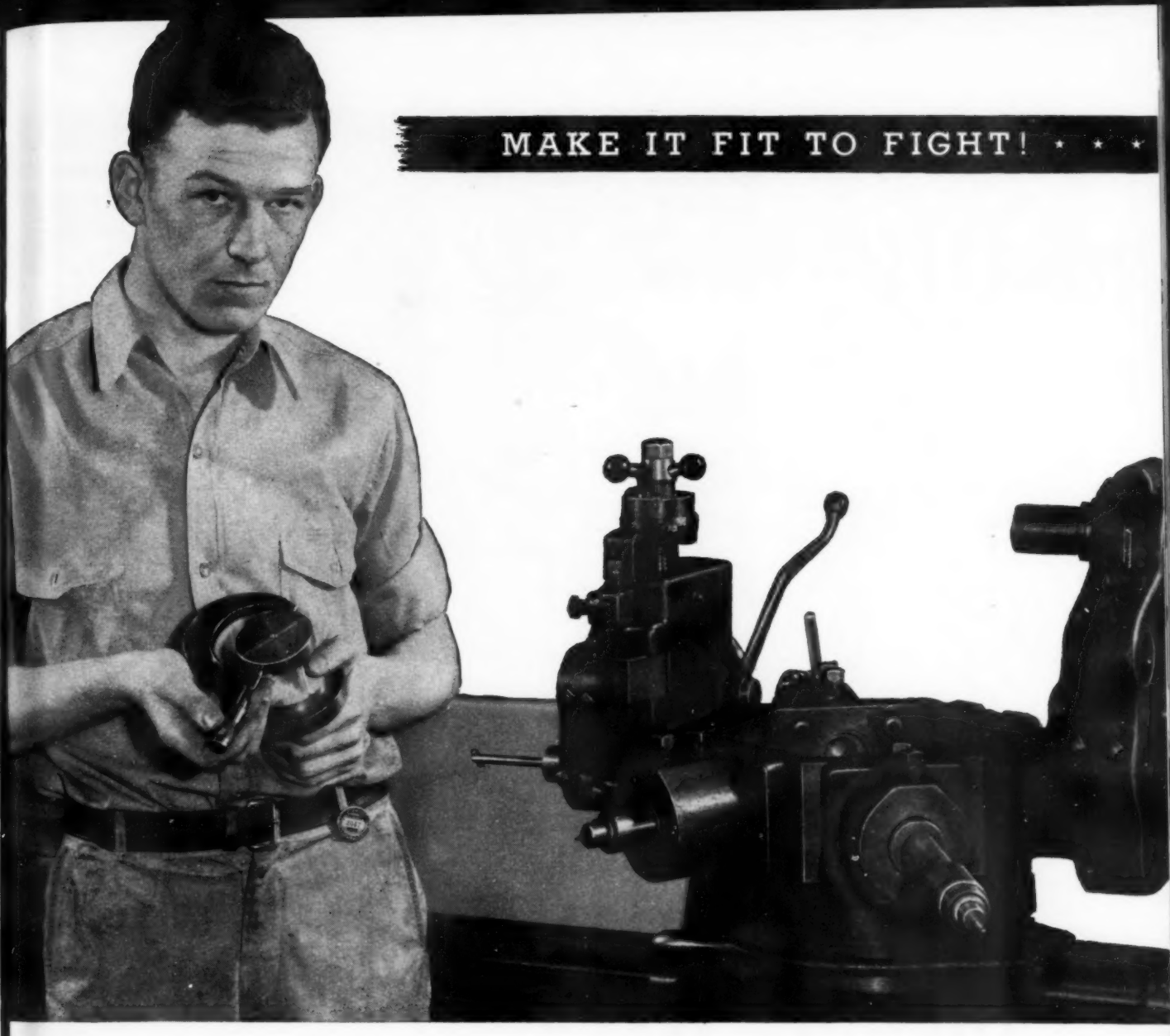
This Book shows how to cut grinding costs. . . . Free to executives. . . . Write for it today.



FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.



Argue with a micrometer? not me!

A thing's either right or wrong in this business! You learn right at the start that there's no "almost" about a tolerance of .0005". In mass production, the micrometer is boss. Interchangeable parts *fit right*—or else!

For this kind of work, calling for accuracy and speed, American industry has learned to depend on Gisholt Turret Lathes.

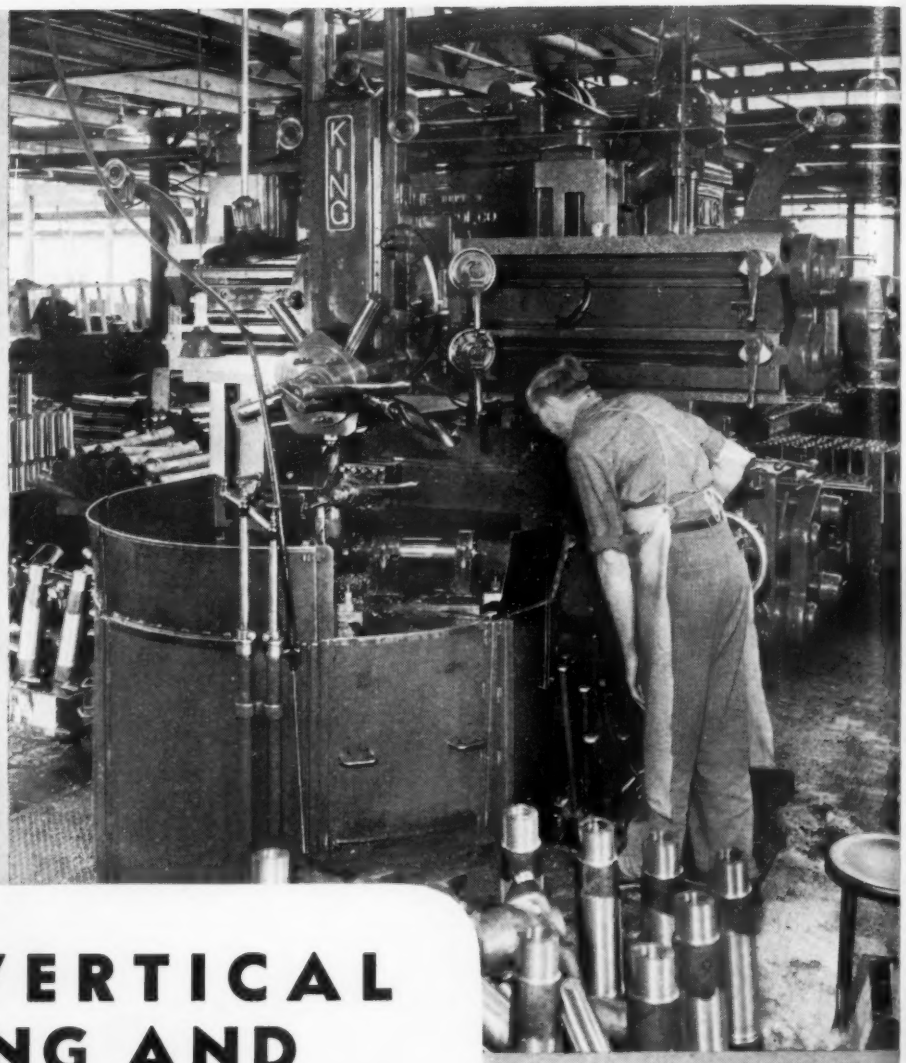
GISHOLT MACHINE COMPANY

1201 East Washington Avenue • Madison, Wisconsin

ok Ahead . . : Keep Ahead . : : With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

Meets Vital War Time Needs



KING VERTICAL BORING AND TURNING MACHINE

In one of America's vital war production plants turning out urgently needed airplane parts for a constantly growing air force this King Boring Mill is contributing to the final completion of this brutal war.

Rigidity that precludes troublesome vibration — power that assures the utmost in speeds and feeds—and design that provides exceptional ease of operation are features of King construction that make for greater production — continued accuracy — and longer life.

For your precision boring and turning operations you can depend on a King Vertical Boring Machine to maintain close tolerances and production requirements at costs that are surprisingly low.

MAKE YOUR NEXT BORING MILL A KING

• • •

KING BUILDS —

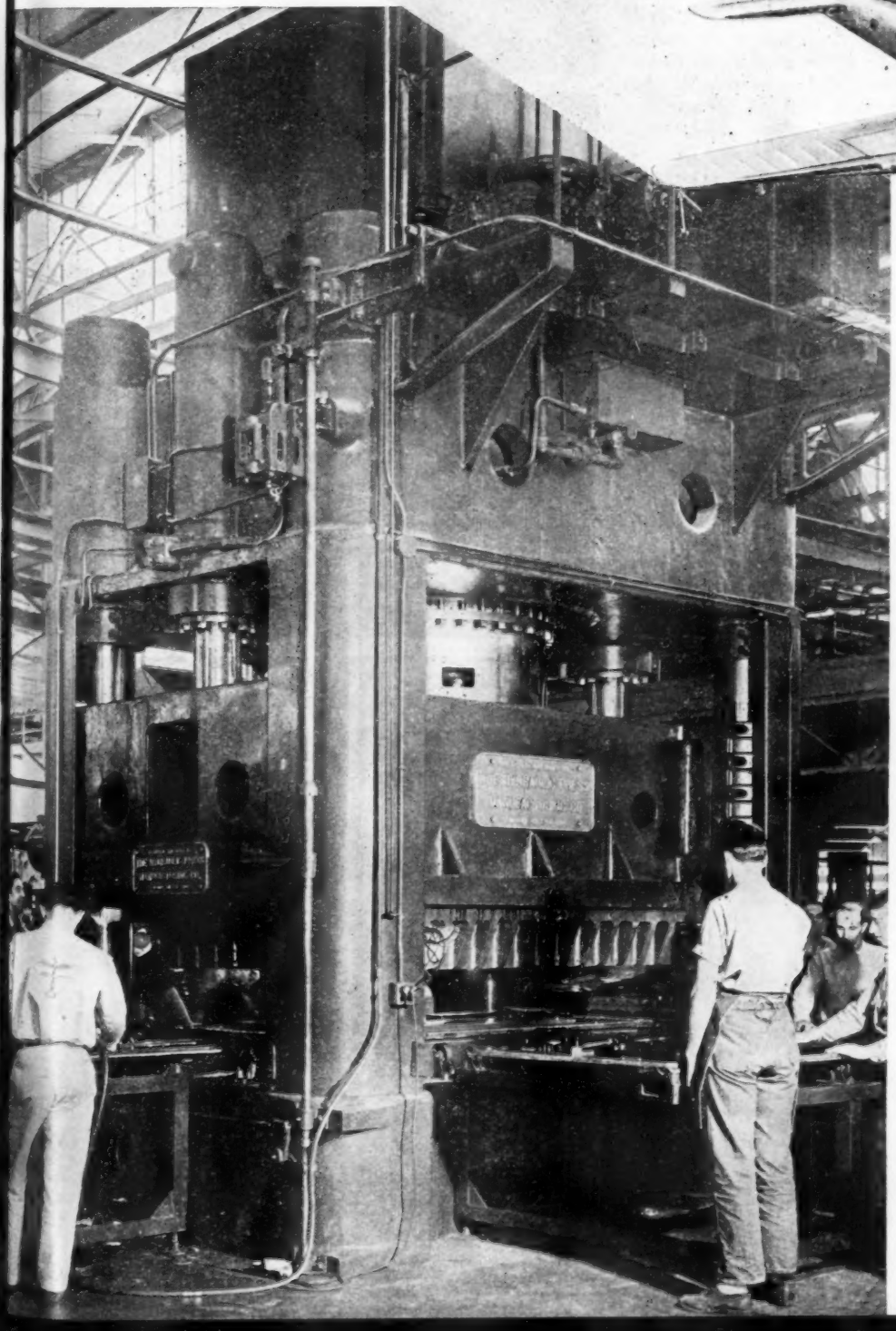
Vertical Boring and Turning Machines in single column types from 30" to 42" and double column up to 10 feet.

The KING MACHINE TOOL Company

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

CINCINNATI, OHIO

HPM FASTRAVERSE PRESSES are responsible for the mass production of Boeing Bombers

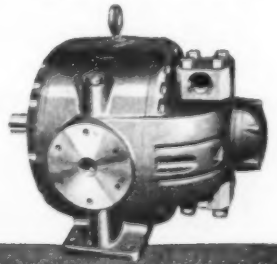


This H-P-M FASTRAVERSE rubber pad forming press is one of many H-P-M presses turning out thousands of formed metal parts for Boeing bombers and trainers. Final victory depends on the continuous operation of these presses. There is no time for shut-downs! That's why H-P-M designs and builds the hydraulic pumps for generating pressure to operate H-P-M presses. There's no chance for undivided responsibility! When you buy an H-P-M FASTRAVERSE press, you buy guaranteed press performance.

THE HYDRAULIC PRESS MANUFACTURING CO.

Mount Gilead, Ohio, U. S. A.

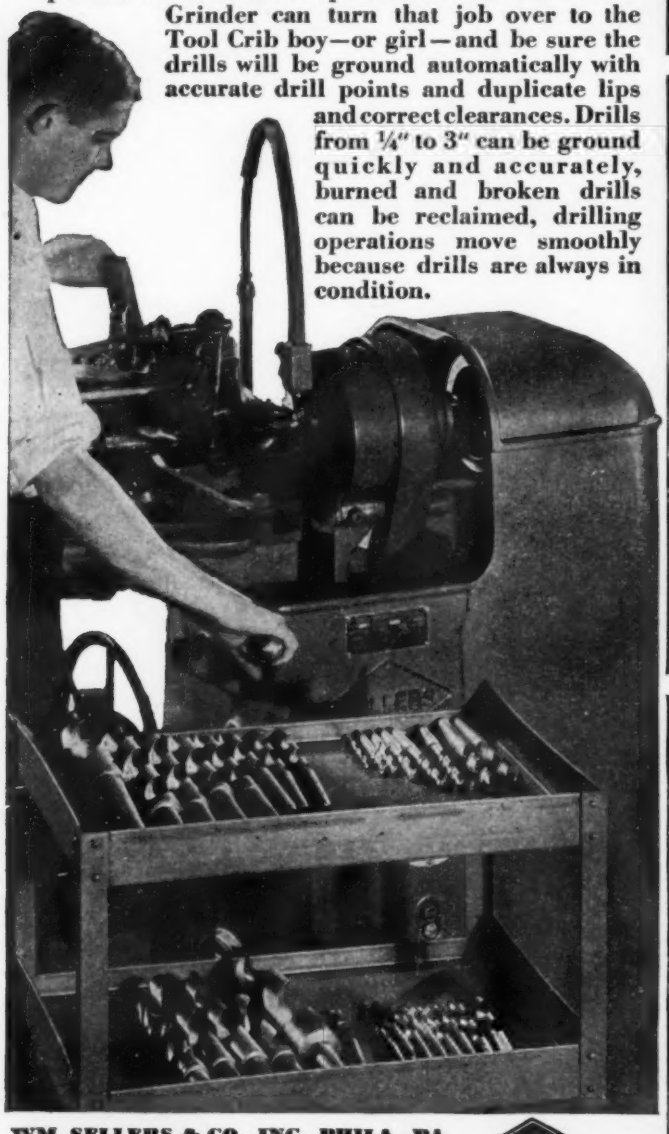
District Sales Offices: New York, Syracuse, Detroit and Chicago
Representatives in Principal Cities



The dependable long life H-P-M HYDRO-POWER Radial Pump powers every H-P-M Hydraulic Press

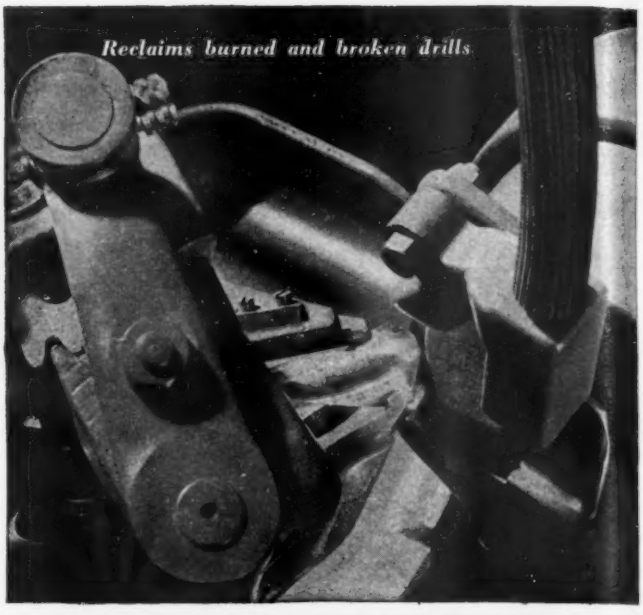
The SELLERS Model 6-G Drill Grinder is Ideally Suited to Present Day Operating Conditions

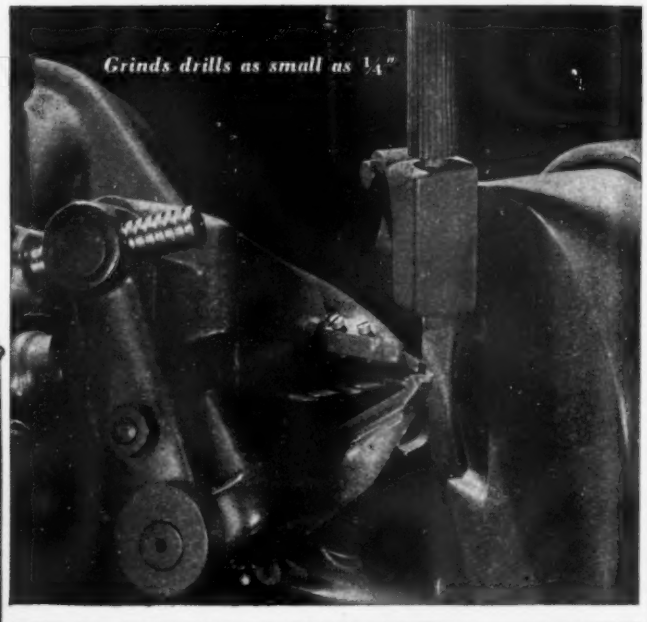
AUTOMATIC!—that is one feature that makes the Sellers Drill Grinder invaluable today. With inexperienced, newly-trained operators, drill grinding can no longer depend on the skill of the old-time machinist who prided himself on his ability to grind tools. The machinist is busy on more important work. So the shop with the Sellers 6-G Drill Grinder can turn that job over to the Tool Crib boy—or girl—and be sure the drills will be ground automatically with accurate drill points and duplicate lips and correct clearances. Drills from ¼" to 3" can be ground quickly and accurately, burned and broken drills can be reclaimed, drilling operations move smoothly because drills are always in condition.

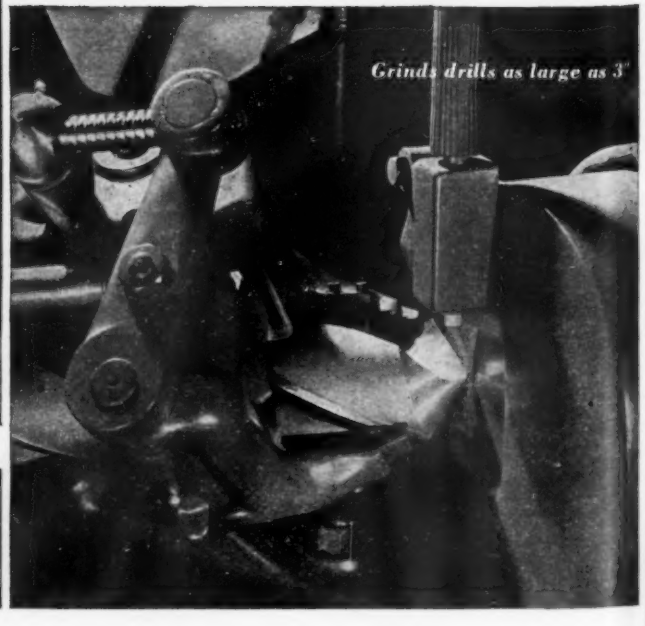


WM. SELLERS & CO., INC., PHILA., PA.

Sellers







Pick the Best a-c Welder!

Today all transformer welders are not alike! Compare . . . and you'll find that one welder—the new Allis-Chalmers Ampac "200"—gives you far more in operating ease, power savings, low upkeep, versatility . . . and in faster and better welding!

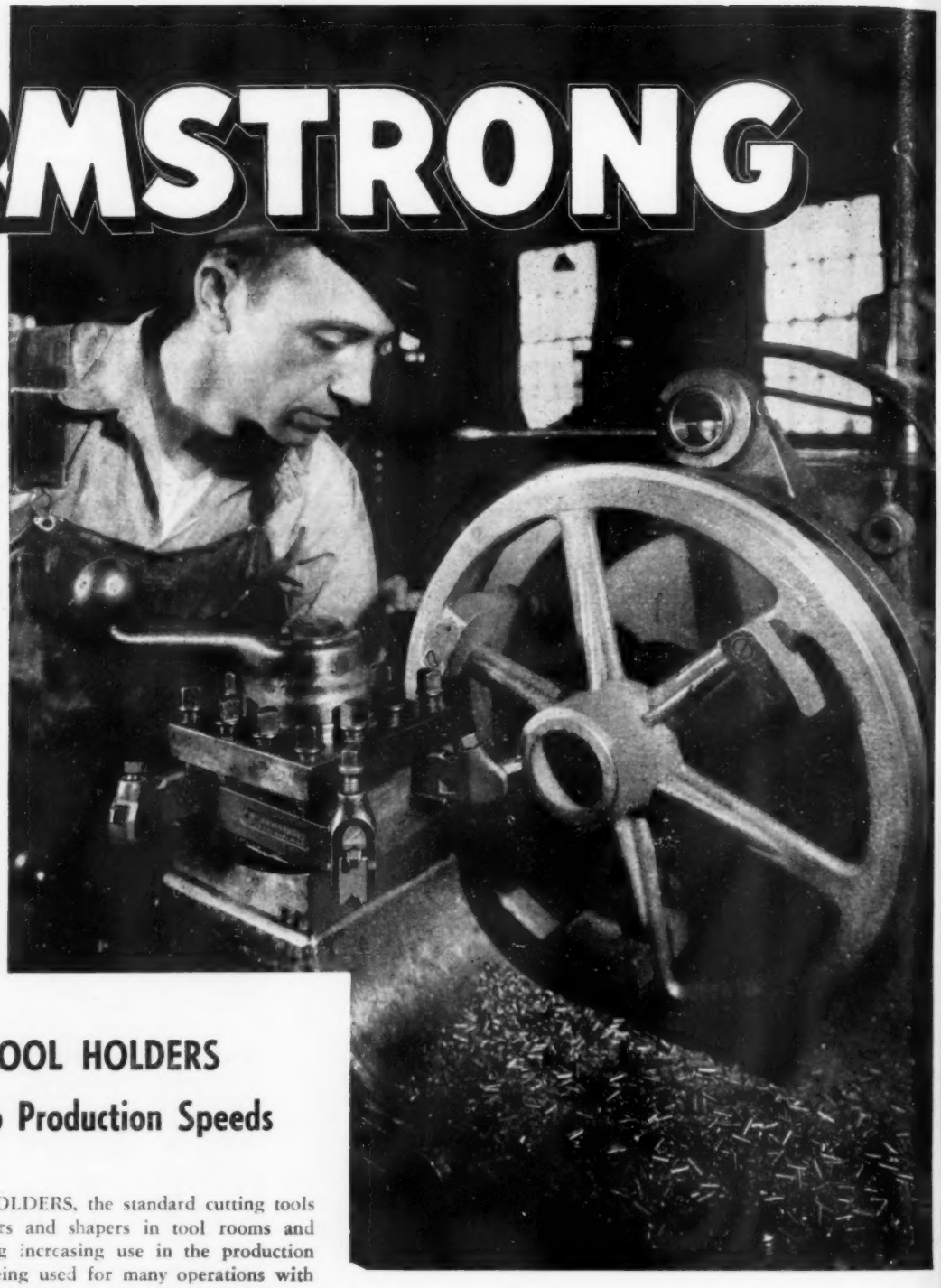
Compare 4 leading types of Transformer Welder in their Use of 11 Important Features . . .

IMPORTANT FEATURES	HOW THEY BENEFIT YOU	AMPAC "200" (Integrated moving core type)	WELDER "B" (Moving coil type)	WELDER "C" (Moving core type)	WELDER "D" (Shunt type, moving core)
1 No arc blow to slow down welding.	Steady arc makes sound, uniform welds. You can weld in corners and grooves easily. Production is speeded.	YES	YES	YES	YES
2 Low striking voltage at high amperage.	Saves power for you. No need for high voltage at high currents. Raises power factor — cuts power input.	YES (65 volts)	NO (75 volts)	NO (75 volts)	NO (75 volts)
3 High striking voltage at low amperage.	Strikes arc fast. Gives you high, yet safe voltage necessary. Makes a-c welding easy at low currents.	YES (78 volts)	NO (72 volts)	NO (75 volts)	NO (75 volts)
4 Takes less than 300 sq. in. floor space.	Small size saves valuable space on crowded shop floors . . . makes it easier for you to move and handle the unit.	YES (281 sq. in.)	NO (361 sq. in.)	NO (398 sq. in.)	YES (288 sq. in.)
5 Contains less than 5 wearing parts.	Cuts maintenance to simple lubrication twice a year. Less chance for wear means longer service, lower upkeep.	YES (4 parts)	NO (8 or more)	NO (6 or more)	NO (8 or more)
6 Low original cost (no rotating element).	Simpler construction of a-c welder cuts purchase price to around 65% of what you would pay for a d-c welder!	YES	YES	YES	YES
7 Wide welding range of over 200 amperes.	You can weld thin sheets . . . yet have capacity for heavy plates, too. You can use rods from 1/16" to 1/4" in size!	YES (220 amp)	YES (215 amp)	NO (195 amp)	NO (195 amp)
8 Reconnectable for 220-440 & 208 v., 60 cycle.	Gives you full capacity at low voltages where lines are long and isolated. Can be used on *any* standard a-c voltage!	YES	NO (220 or 440)	NO (220-440 only)	NO (220-440 only)
9 Over 85% efficiency at normal loads.	You enjoy *full* benefits of a-c welding: lower power loss, high power factor, lower operating costs!	YES	NO	YES	YES
10 All settings within six control turns.	Saves welding time. Welder can make simple adjustment from high to low amperage current quickly and easily.	YES (6 turns)	NO (50 turns)	NO (30 turns)	NO (15 turns)
11 Movement of variable part 2" or less.	Cuts wear and maintenance to a minimum. Reduces hum and vibration Contributes to trouble-free operation.	YES (1 inch)	NO (9 inches)	NO (6 inches)	YES (2 inches)
		11 Ampac "200"	3 Welder "B"	3 Welder "C"	5 Welder "D"

Only Ampac gives you all 11 . . . TOTALS

ALLIS-CHALMERS AMPAC "200" WRITE ALLIS-CHALMERS, MILWAUKEE, WIS., FOR COMPLETE INFORMATION

ARMSTRONG



ARMSTRONG TOOL HOLDERS
will stand up to Production Speeds

ARMSTRONG TOOL HOLDERS, the standard cutting tools on lathes, planers, slotters and shapers in tool rooms and machine shops are finding increasing use in the production departments. They are being used for many operations with ARMSTRONG TURRET LATHE and SCREW MACHINE TOOLS on production lathes of all sorts, . . . are being used on large automatics and special machines.

They stand up to the highest cutting speeds, to the heaviest "production" cuts and because of their availability are preventing costly delays for tooling up. They are also saving quantities of critical high speed steel, for in an ARMSTRONG TOOL HOLDER each ounce of high speed steel does the work of 10 ounces in a forged tool.

It is a good policy when tooling *any* metal-cutting job to check thru the ARMSTRONG Catalog, for in the more than 300 sizes and types of ARMSTRONG TOOL HOLDER you will often find a tool that will exactly fit your need.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. FRANCISCO AVE. CHICAGO, U. S. A.

Eastern Warehouse and Sales:
199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

More and more **PARTS FOR WAR WEAPONS OF ALL KINDS ARE BEING PRODUCED ACCURATELY,** *at top speed*

Photo by U.S. Army Signal Corps

ON P&J *Automatic* CHUCKING EQUIPMENT

The closest degree of accuracy is being maintained by P&J equipment under ever-increasing production demands.

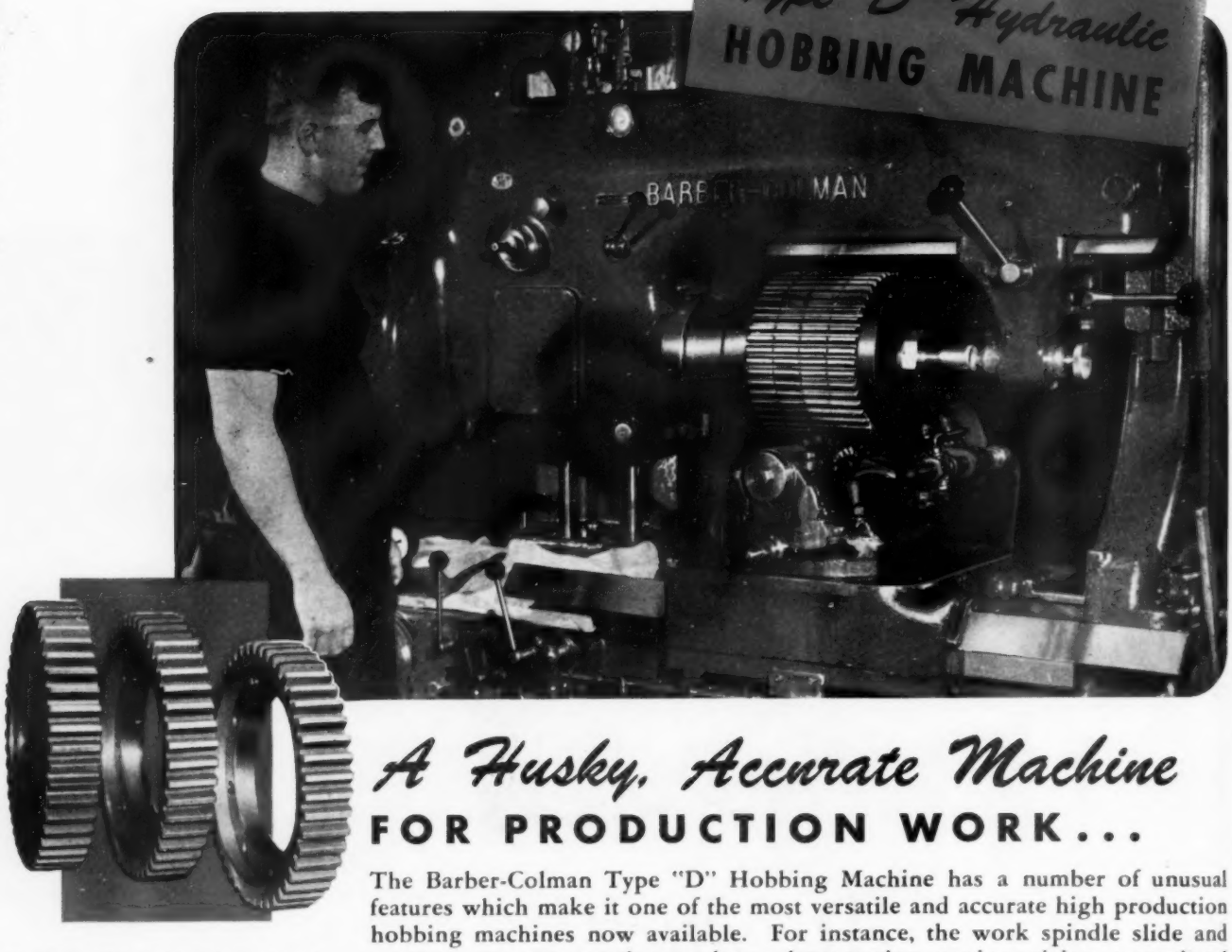
More than forty years ago, Potter & Johnston pioneered the development of machines for turning out duplicate parts in quantity. The experience thus gained has stood the war effort in good stead because it has enabled P&J to apply its highly specialized knowledge and technique to the machining of an almost unlimited variety of parts involved in implements of war. Specific examples of P&J's contribution include precision-made parts for airplanes, airplane engines, anti-aircraft and machine guns, adaptors for shells and many other weapons.

P&J Automatic Chucking Machines continue to go into war-production plants to make more parts available in less time—parts that meet the most rigid specifications for accuracy and finish.

The **POTTER & JOHNSTON MACHINE CO.**

GIVE THEM MORE OF EVERYTHING THEY NEED

BARBER-COLMAN Type "D" Hydraulic HOBBING MACHINE



The Type "D" machine shown here is hobbing an axle drive gear, requiring good finish and accuracy. These gears are previously rough hobbed on this same machine. The finishing cut is made at a feed of .085" per rev. of work and a hob speed of 88 r. p. m. The piece is SAE 4620 steel, 12" O. D., 2¼" face, 47 teeth, 4/5 pitch, 20° P. A. involute form. Production is 32 pieces in 8 hours. Tolerances held are .006" maximum eccentricity and .005"/.010" backlash.

A Husky, Accurate Machine FOR PRODUCTION WORK...

The Barber-Colman Type "D" Hobbing Machine has a number of unusual features which make it one of the most versatile and accurate high production hobbing machines now available. For instance, the work spindle slide and overarm are one continuous heavy box section casting giving exceptional ruggedness and rigidity for heavy work. The outboard support is a single pedestal, set back to provide clear entrance for long work. An extra heavy hob carriage will handle hobs up to 5½" x 5" with straight hole, or 5½" x 4" with taper hole. This machine is designed throughout to meet, and exceed, modern accuracy requirements of heavy-duty high-production work, ranging up to 14" diameter and 14" long, 3 diametral pitch and finer.

Unusual Flexibility with Hydraulic Drive

A distinguishing feature of this machine is the hydraulic drive on the feed screw and the hydraulic clamping mechanism on the work slide. The feed is infinitely variable over a wide range by a single control, and is synchronized with the rest of the drive through a differential. The clamping units clamp the work slide at five points simultaneously, saving substantial time in loading and unloading. Another outstanding feature is the accuracy with which depth of cut is duplicated by means of hardened and ground stops on the work slide, held in positive contact by hydraulic pressure. Write for bulletin F-1477-1.

Buy War Bonds

BARBER B-C COLMAN PRODUCTS
HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

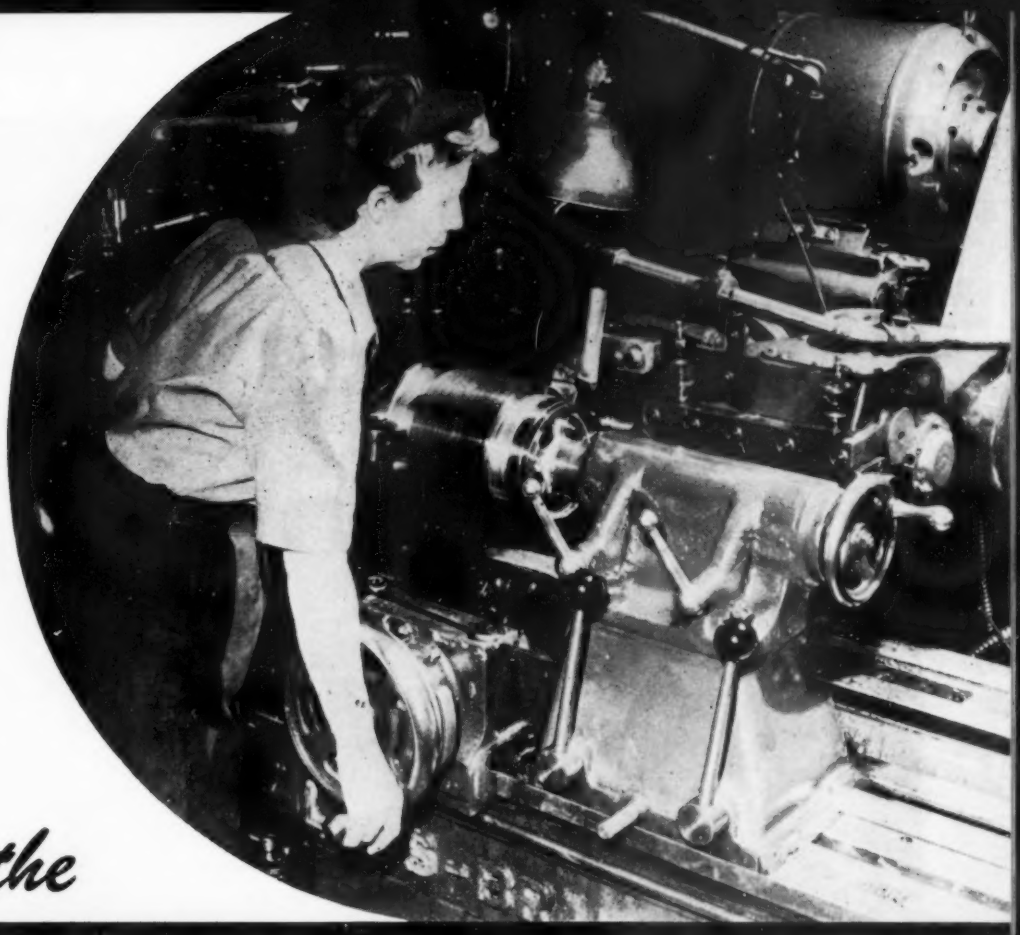
GENERAL OFFICES AND PLANT • 201 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

Aircraft Engine Builders

★

WHEN MATERIAL IS TOUGH —TOLERANCE IS RIGID —PRODUCTION HIGH

Put it on the



LEES-BRADNER THREAD MILLER

To generate the thread on heat treated aircraft engine cylinder barrels with girl operators, to finish mill internal threads in aircraft engine propeller shafts, and to perform numerous other threading operations on aircraft engine components — to today's production requirements—and to rigid Air Corps inspection requirements —

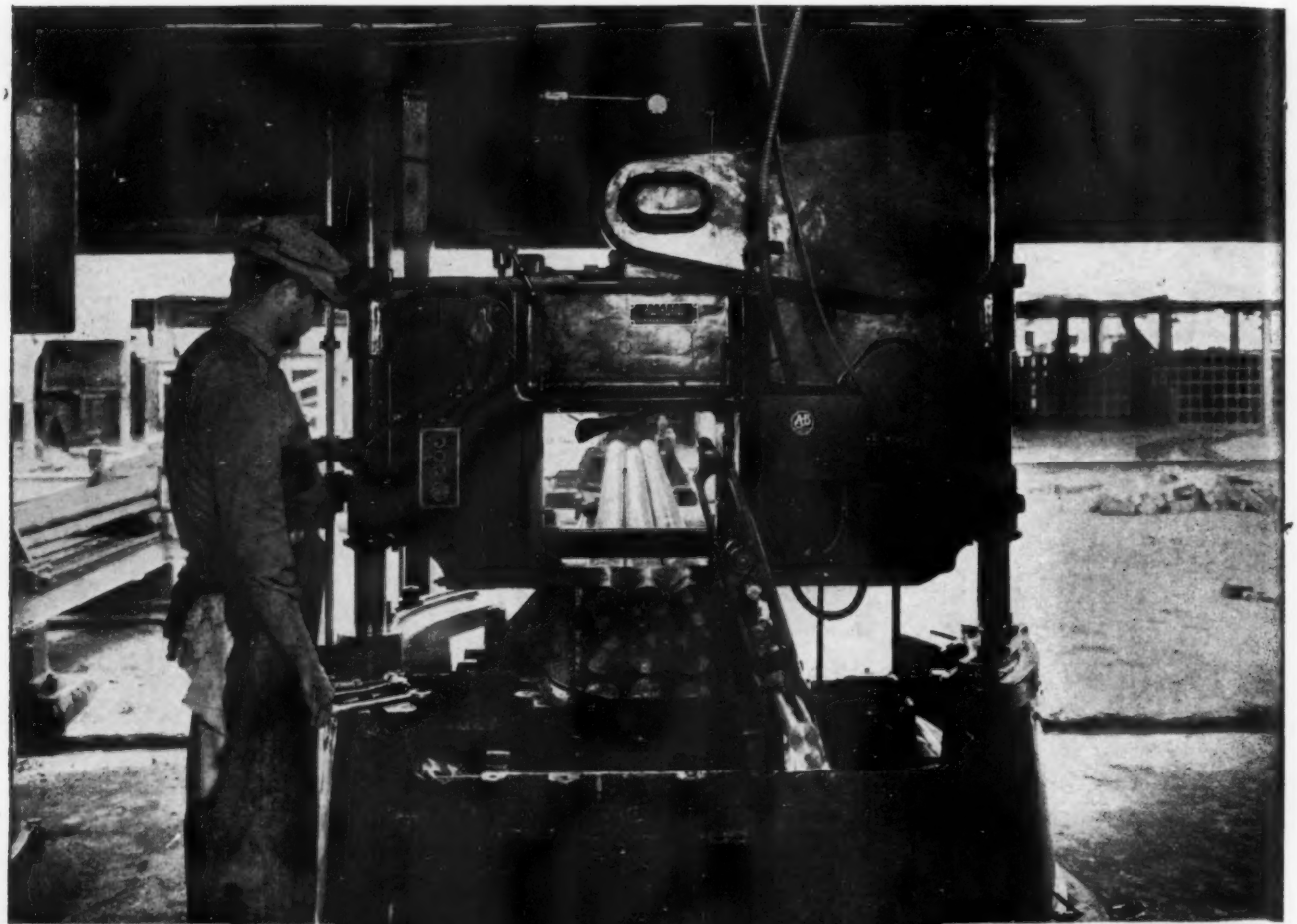
Put it on the Lees-Bradner!

Milling many threads after heat treatment is also thoroughly practicable on an HT.

Why not consult a Lees-Bradner Tool Engineer on your precision threading requirements?

The LEES-BRADNER *Company*

CLEVELAND, OHIO, U.S.A.



MARVEL SAWS

Cut anything that will go between the jaws

This is one of five No. 18 MARVEL Giant Hydraulic Hack Saws used by a well known Texas tool company to cut-off "multiple bars of alloy steel in round, square, and flat shapes, up to the maximum capacity of the large work-throat (18" x 18")".

These super hack saws are designed for the largest sizes, and toughest steels—up to 18" x 18". After a year's heavy duty service, when asked as to the effectiveness of these saws in solving the cutting-off problems at this plant, the mechanical engineer in charge reported them "very effective."

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave. Chicago, U. S. A.
Eastern Sales Office: 225 Lafayette St., New York

FOR STRONGER, CLEANER RESISTANCE WELDS . . .

Micro-Timing BY ELECTRONIC CONTROL

LIKE THE MAN ON THE FLYING TRAPEZE . . .

. . . synchronization is important to the control of resistance welding current. Especially on short-time welds of a few cycles, random closing of the circuit produces an undesirable variation in weld quality. Synchronous Control starts and stops weld current at the right point of the wave . . . produces high-quality welds of uniform spot size and strength.

Precision timing with electronic control splits seconds into sixtieths and smaller. Resistance welds are sounder, surfaces are less affected and electrodes last longer, give more spots per cleaning.

Westinghouse supplies all the necessary equipment for electronic control of resistance welding. A typical installation, (shown above) uses two Westinghouse units to control a spot welder which handles work up to ¾" in thickness.

1. **SEQUENCE TIMER** controls the sequence of electrode operations—opening and closing them for preset periods accurate to within one cycle or 1/60th of a second.
2. **COMBINATION SYNCHRONOUS TIMER** combines three separate Westinghouse controls in one compact, floor model. **WELD-O-TROL** makes and breaks heavy welding currents as high as 10,000 amperes without flash or noise. **HEAT CONTROL** regulates the heat supplied to the weld from 20 to 100%. **SYNCHRONOUS CONTROL** assures that the power circuit is always closed at the same point on the voltage wave so as to prevent transients which cause uneven welds.

These precision controls save critical materials and increase weld production. Rejects are fewer, welds are faster, more consistent. Ask your Westinghouse representative how electronic control can increase your war production. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N.

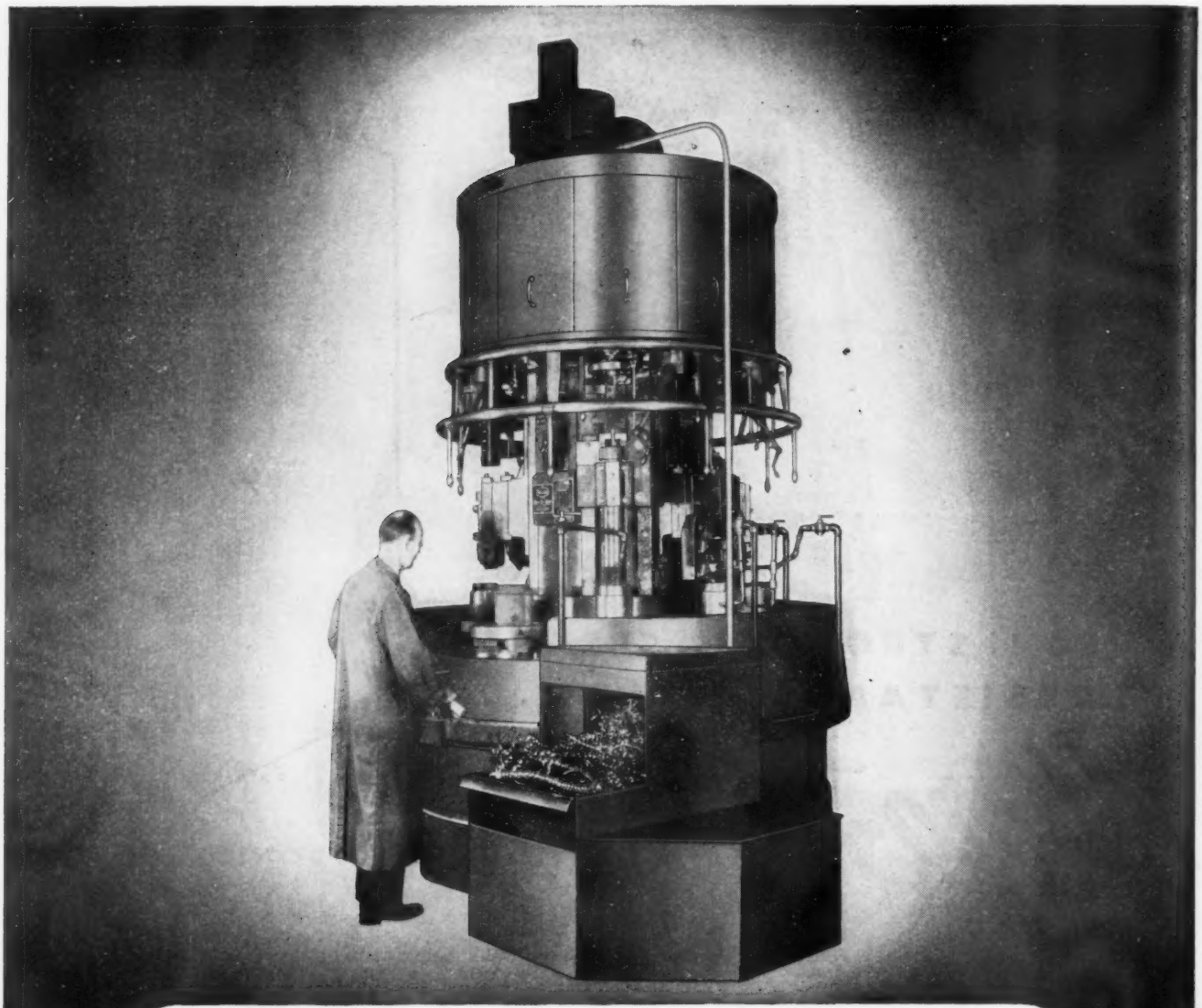
J-21273

Westinghouse ELECTRONICS

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

RESISTANCE WELDING CONTROL



Mult-Au-Matic PRODUCTION...

The Bullard Mult-Au-Matic keeps producing while your operator loads the work. One of its 8 stations is for loading, while the other stations keep right on going. Result:—on the job shown here, a finished cylinder sleeve at every index of the carrier.

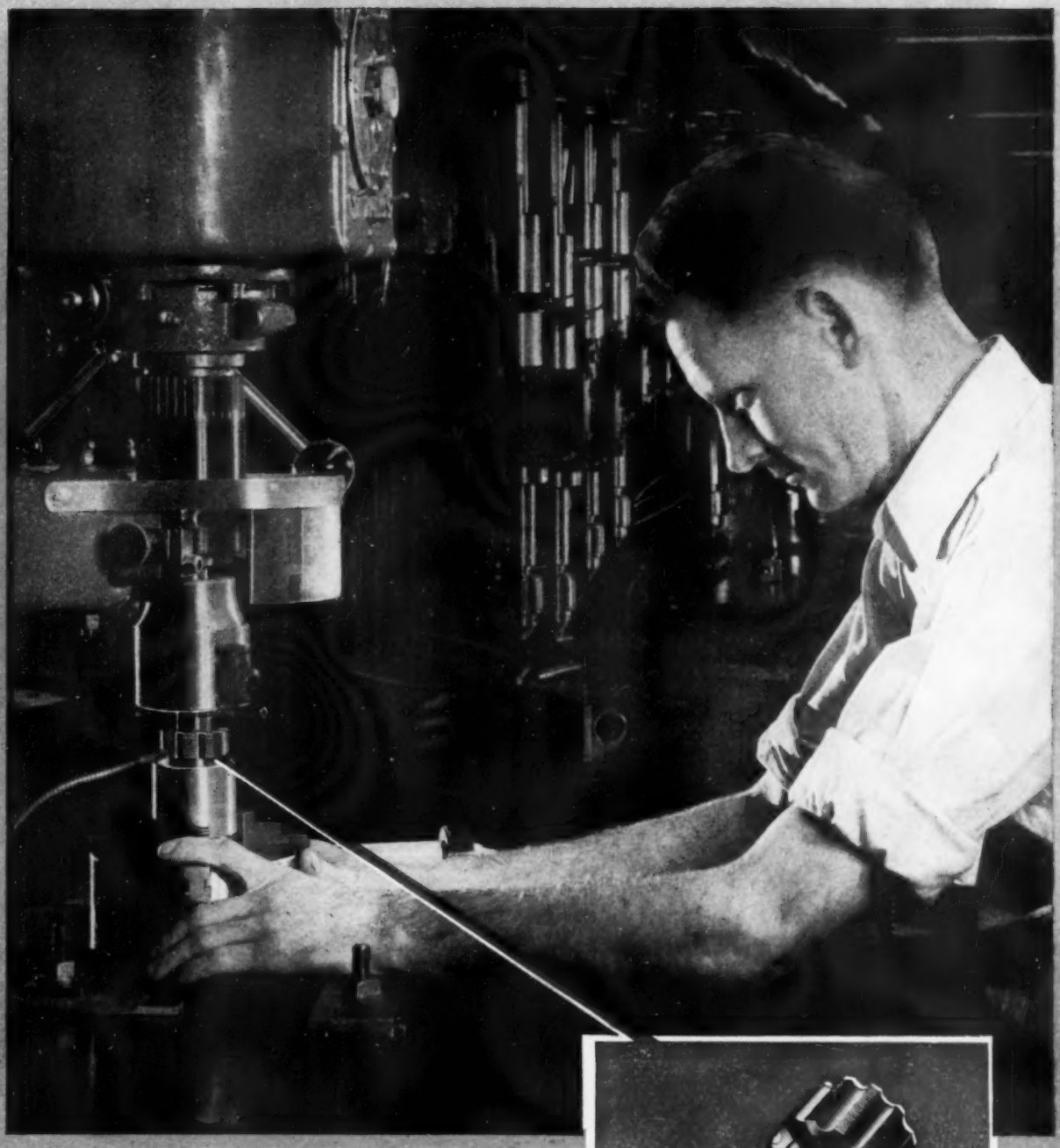
One user doing war work says—"The machines themselves are doing an excellent job, and an important result of their use is the releasing of 48 operators to serve in the armed forces. So that not only are your machines producing parts for tanks, but, indirectly, soldiers for the Front. I am sure that our experience is multiplied many times by the results obtained by the numerous other concerns using your equipment, and your men should be very proud of the substantial direct and indirect contributions they are making to the war effort."

Only MULT-AU-MATICS *Have All These Features*

- 8 Stations
- Independent Speeds and Feeds at Each Station
- Vertical Chucking
- Minimum Floor Space
- Automatic Operation
- Simplified Tooling
- Easy Changeover
- Gravity Flow Lubrication
- Interlocking Safety Devices

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT U. S. A.



Something NEW in Taps

VARD is helping to conserve high-speed steel by producing precision taps made in two pieces. The shank is mild steel, the cutting head is carbon or high-speed steel. The head is fastened to the shank by a strong keyway and a fast-acting hollow headed screw. A number of sizes of heads are interchangeable on the same shank.

Speed up your tapping and help save vital material by using these precision ground VARD two-piece taps. Made in sizes from 2½" to 4" in all standard thread forms (except Whitworth) and in right or left hand thread.

ARMY (E) NAVY

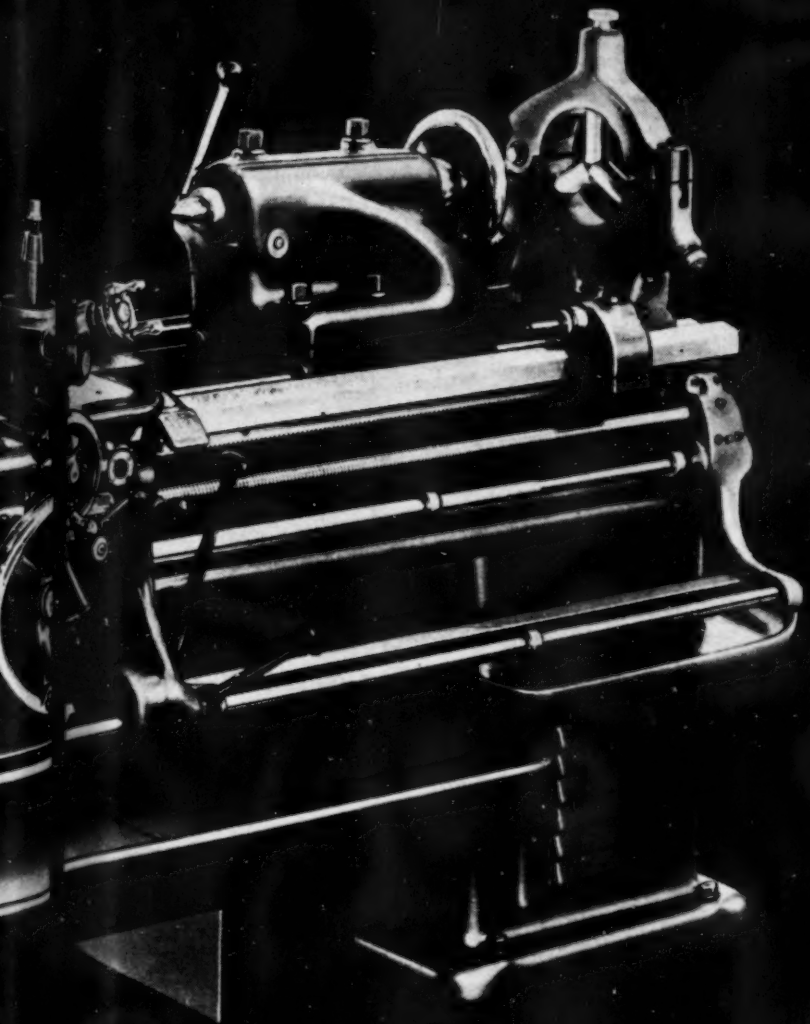
VARD INC.

PASADENA, CALIFORNIA

FOR
ALL-OUT
PRODUCTION

PROTECT YOUR SHOP AGAINST MAN-POWER SHORTAGE BY UTILIZING THE EXTRA PRODUCING CAPACITY OF . . . .

"AMERICAN" Pacemaker LATHES



The danger to production resulting from the induction of manpower from production shops, can be minimized, by replacing slow, inefficient, effort-consuming lathes with fast, convenient, easily-handled "AMERICAN" Pacemakers.

Time and again an "AMERICAN" Pacemaker operator easily produces as much work as two equally efficient operators on old machines. On the basis of manpower and machine productive power alone, the shop equipped with "AMERICAN" Pacemaker Lathes is in a far better position to maintain all-out production with fewer men and machines than the shop that clings to its old machines and the hope that it will not be caught by a shortage of machine operators.

Insofar as quality of work is concerned, the "AMERICAN" Pacemaker can be depended on for outstanding accuracy at all times and under all conditions.

LATHES
RADIALS
SHAPERS

The
AMERICAN
TOOL WORKS CO.
Cincinnati, Ohio

Retracting and Repositioning Work Within .0002 OF AN INCH—By Push Button

The most frequently needed function in a precision boring machine is that of retracting the work to facilitate measuring and tool setting.

In the DeVlieg Jigmil, this function is automatic—by fingertip control. Operation of a push button unlocks the table and moves it by rapid traverse to the desired position for measuring. For repositioning, operation of a single push button will cause the table to return to its cutting position by rapid traverse, stopping and locking automatically. Uniformity of selected position for stopping and locking is dependable within .0002″.

The DeVlieg Jigmil is a new type machine—has the spacing accuracy of a Jig Borer—Performance Qualities of a Milling Machine—Convenience and Flexibility of a Horizontal Boring Mill. All control is so centered and organized that the operator never has to take his eyes off the work.

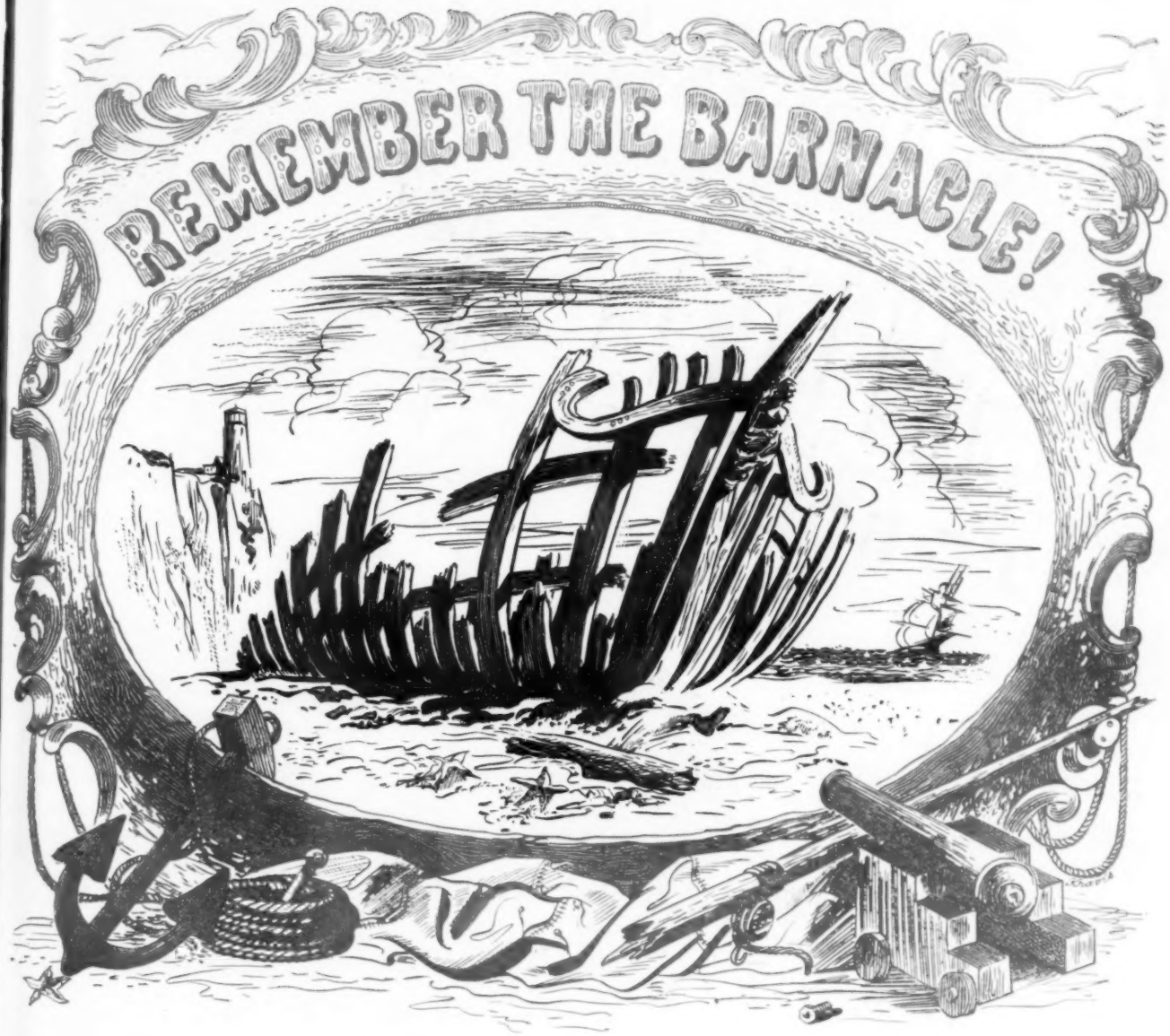
Thus, the Jigmil fulfills the machine tool ideal—a powerful and accurate extension of the operator's hand.

Many machines show 75 per cent greater average daily productivity.

DE VLIEG MACHINE COMPANY
450 FAIR AVE. FERNDALE (DETROIT) MICHIGAN

Write for Circular

DEVLIEG MACHINE TOOLS



With that curtly classic reminder, one of America's most famous research engineers replied to a man in the act of rhapsodizing about the wonderful ingenuity of man.

For the barnacle, he pointed out, is a symbol of all those things that have *not* been done—a tiny marine organism that costs us millions every year—simple, "impossible" things that are still to be accomplished.

The development of lighter and stronger alloys, permitting 3, 5, or even 10 horsepower for every pound of engine weight, instead of one-to-one . . . cheaper color photographs and faster engravings and better television . . . swifter ways of making and working new super-hard alloys . . . scores of different kinds of rubber "growing" on factory floors, and fuels 3 or 4 times as powerful as 100-octane gasoline . . . even solar energy, and atomic power, and—remember the barnacle! These are but a few from a list of certainties and possibilities as long as man's imagination.

Under the secrecy of forced-draught war research, many incredible accomplishments—seemingly impossible within our time—have already occurred. For obvious reasons, these may not be discussed, but of one thing we can be certain: The end of this war will inaugurate the greatest era of industrial surprises since the age of machinery began.

And the shift to light metals and plastics may be as consequential as the shift from bronze to iron!

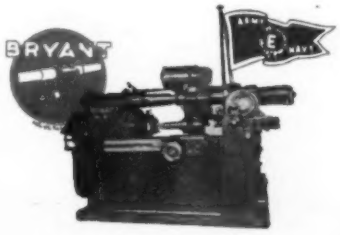
We at Bryant have developed many new techniques during the past few months. Our engineers are working on hundreds of production lines today, helping to solve production problems involving the machining of hard rubber, plastics, glass, graphite, cast iron and bronze, as well as forged, centrifugally cast and surface-hardened steels, light metals and alloys from a hundred new specifications.

If this wealth of new experience can be of value to your business, it's there for the asking. For Bryant's Consulting Service on internal grinding is available to you at all times.

Call upon us now!

Bryant Chucking Grinder Company

SPRINGFIELD, VERMONT, U. S. A.



SEND FOR THE MAN FROM BRYANT

Meets Vital Production Need

FOSDICK
JIG BORER

● To put our plants producing war materials on a mass production basis required thousands upon thousands of special jigs and fixtures.

In one of our midwest cities Tool and Die Companies have been working 24 hours a day 7 days a week to meet this vital need.

Fosdick Jig Borers because of their accuracy, versatility and ease of operation are being used by the hundreds to help meet the demand for these special tools.

If your work calls for accuracy and ability to make quick change overs put it on a Fosdick Jig Borer. You'll find it the most economical machine in your shop both from standpoint of first cost and actual operation.

FULL DETAILS WILL BE FOUND IN FOSDICK JIG BORER BULLETIN "J.B.A."

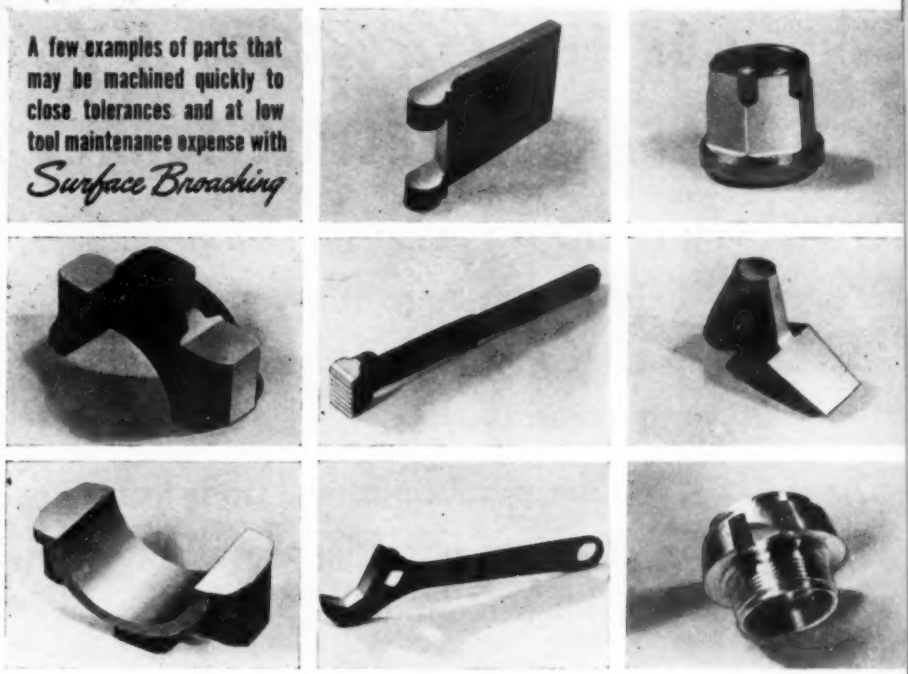
Surface Broaching...

A FASTER PRODUCTION METHOD

• Footburt Surface Broaching Machines have been showing remarkable saving on many war contracts; through faster production per man and in tool maintenance costs. Many jobs that were slow and expensive when handled by conventional machining methods are now being surface broached on Footburt machines. Production in most cases is as fast as the speed at which parts can be loaded, yet cutting speeds are so low that the cost of tool maintenance shows great savings. Exceptional finish can be maintained. We will gladly discuss your machining problems with you.

THE FOOTE-BURT COMPANY
CLEVELAND, OHIO
Detroit Office: General Motors Building

A few examples of parts that may be machined quickly to close tolerances and at low tool maintenance expense with *Surface Broaching*



FOOTBURT *Surface* BROACHING

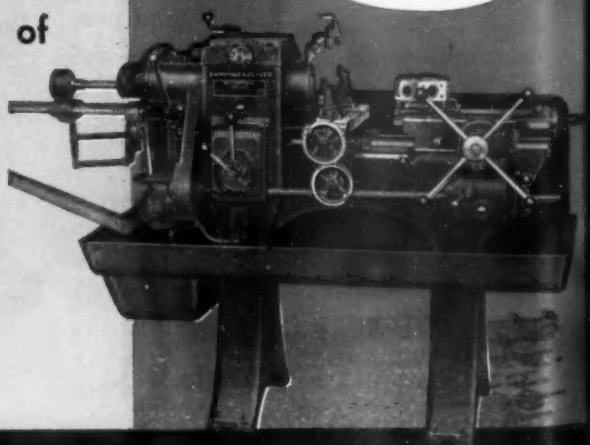
Women Operators ENJOY MASS PRODUCTION OF SMALL PARTS

ON THE *Bardons & Oliver* NO. 2 GEARED ELECTRIC TURRET LATHE

Bardons and Oliver

It is difficult to imagine how a machine could be easier to run yet capable of sustained high speed production and accuracy.

If you are producing small parts from bars, forgings or castings let us give you further information.



BARDONS & OLIVER, INC. 1133 W. 9th STREET CLEVELAND, OHIO

YOUR LIFE WILL BE . . .

Perhaps you take no stock in things occult! Perhaps you wouldn't believe what this mystic might predict. And we don't ask you to. But it *is* entirely possible to peer into the future lives of rotating parts. In fact, it's being done every day—through the medium of the Dynetric Balancing Machine. And it's done for thoroughly practical reasons—to detect and correct their weaknesses in static and dynamic balance—to protect them against vibration and excessive wear—to insure the longest possible life and the most efficient service. And there's nothing mysterious about it!

At Gisholt, the Army-Navy "E" and the Treasury flag fly side by side.

GISHOLT MACHINE COMPANY
1201 E. Washington Avenue
Madison, Wisconsin

GISHOLT DYNETRIC BALANCING MACHINES *enable you to foresee the hazards which affect high speed rotating parts and to eliminate them. Electronic tubes clearly reveal unbalanced vibrations by amplifying them as much as 1,600,000 times. Literature on Dynetric Balancing is yours on request.*

GISHOLT

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

NEW PRODUCTS

Electronic Drive

Because most a.c. motors are built for a single designated speed, and most industrial plants are supplied only with a.c. power, manufacturers use various expedients to secure variable speeds when needed. These can take many forms ranging from step-cone pulleys and variable speed gears on machine tools and other equipment to elaborate installations of various types for converting a.c. to d.c., permitting use of d.c. motors.

Newest method of changing speeds is electronic, wherein thyratron tubes take just as much a.c. power as is needed for a given speed and convert it for a d.c. motor. Newest outfit of the type is the Mot-O-Trol Electronic Adjustable-Speed Drive, just announced by Westinghouse Electric & Mfg. Co., East Pittsburgh. Stripped of technicalities, it consists of a cabinet which looks something like a radio, a switch, and a shunt-wound d.c. motor. You set a radio-like dial to the speed desired and flip the switch. A standard drive is available for ratings up to 1 hp. and a speed range of 1 to 20; more powerful drives can be designed to special order, with wider speed ranges.

J-21287

P.S.

WE'LL BE GLAD TO SEND YOU THE FULL STORY . . . .

ASK FOR NEW BULLETIN B-3256

Westinghouse ELECTRONICS

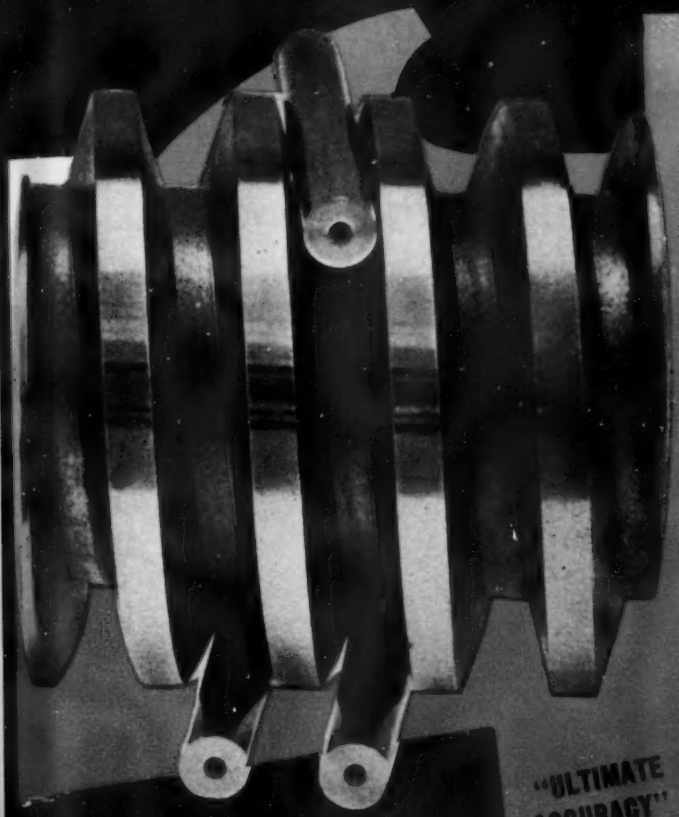
WESTINGHOUSE

Westinghouse ELECTRIC & MFG. CO.
EAST PITTSBURGH, PA.

USE Van Keuren MEASURING WIRES

for more accurate measurements . . . of 29° and

40° WORMS, ACME THREADS, NATIONAL 60° THREADS, SPLINES *and* SPUR GEARS . . .



"ULTIMATE ACCURACY"

The 2 pitch single thread 29° worm thread illustrated can be accurately produced and measured with Van Keuren 2 Threads per inch 29° worm wires which are .2574" in diameter. Worm wires are figured to come flush with the top of the finished worm thread if the pitch diameter and form of thread are correct.

Worm measuring wires are available from stock in single sets of 3 wires of a size for pitches from 1 to 20 threads per inch and for diametral pitches from 2 to 80 or in complete assortments in the above ranges for either 29° and 40° worms.

Van Keuren measuring wires are manufactured to National Bureau of Standards specifications. They are hardened, ground and lapped by precision methods developed over a quarter of a century. They are accurate to within .00002" for roundness and straightness and within .000025" for exact size. Over 200 sizes of standard measuring wires are available from stock. Special sizes from .002" to 1.500" diameter are furnished on order to meet the customer's specifications.

Van Keuren Set. No. 26 External gear measuring wire set is designed for measuring external spur gears from 2 to 80 Diametral pitch. Furnished complete with instructions and simplified gear tables.....$145.00

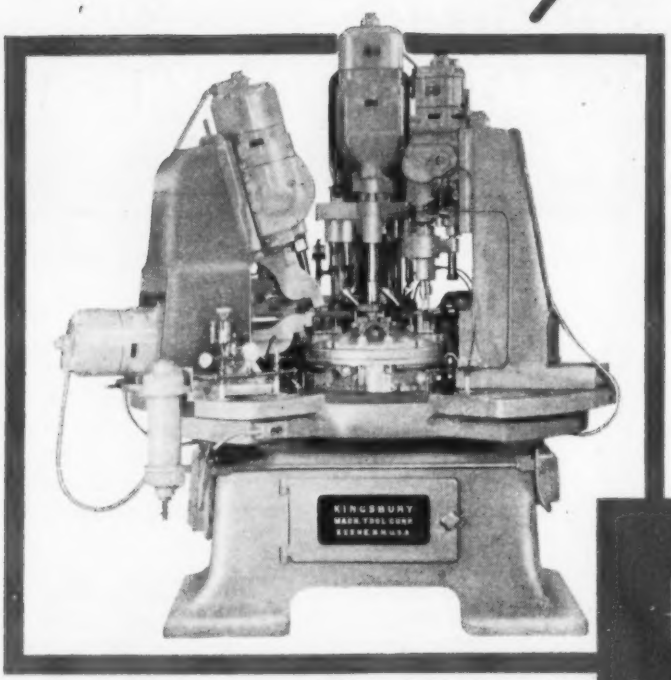
The Van Keuren Manual No. 31 of precision measuring tools, gives complete information on how to use measuring wires for accurate measurements. Send for your copy of this valuable book.

Van Keuren CO., 176 WALTHAM ST., WATERTOWN, MASS.

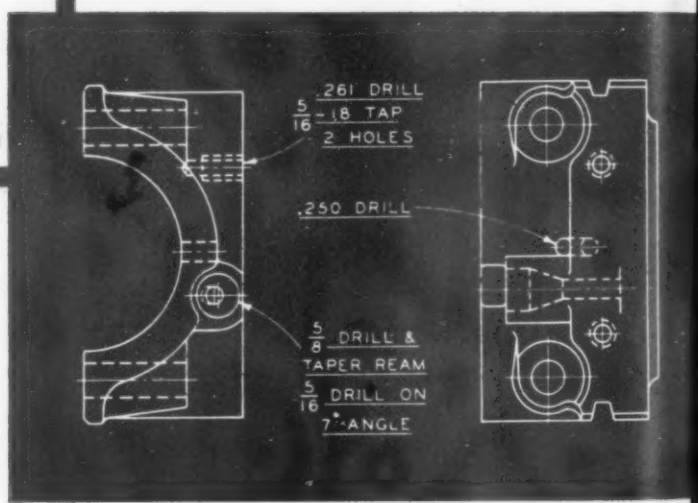
24th YEAR

Light Wave Equipment • Light Wave Micrometer • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages
Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles

FLEXIMATIC
by KINGSBURY



Three operations from three different directions handled in a single chucking of the work . . . . .



The advantage of the KINGSBURY FLEXIMATIC method for performing various machining operations in a single chucking of the work is exemplified here. The parts involved are automobile rear main bearing caps which are drilled, reamed and tapped on a Model GD FLEXIMATIC from three different directions without rechucking. All operations occur simultaneously during unloading and loading.

Obviously, ability to handle work of this nature in the way it is handled on a FLEXIMATIC means outstanding production capacity. To this advantage must be added the precision which characterizes FLEXIMATIC performance—a combination which is of such outstanding value today because it makes every minute count in high speed precision production. Furthermore, KINGSBURY FLEXIMATICS conserve man power through the ability of one operator to easily out-step the productivity of several men on general purpose machines.

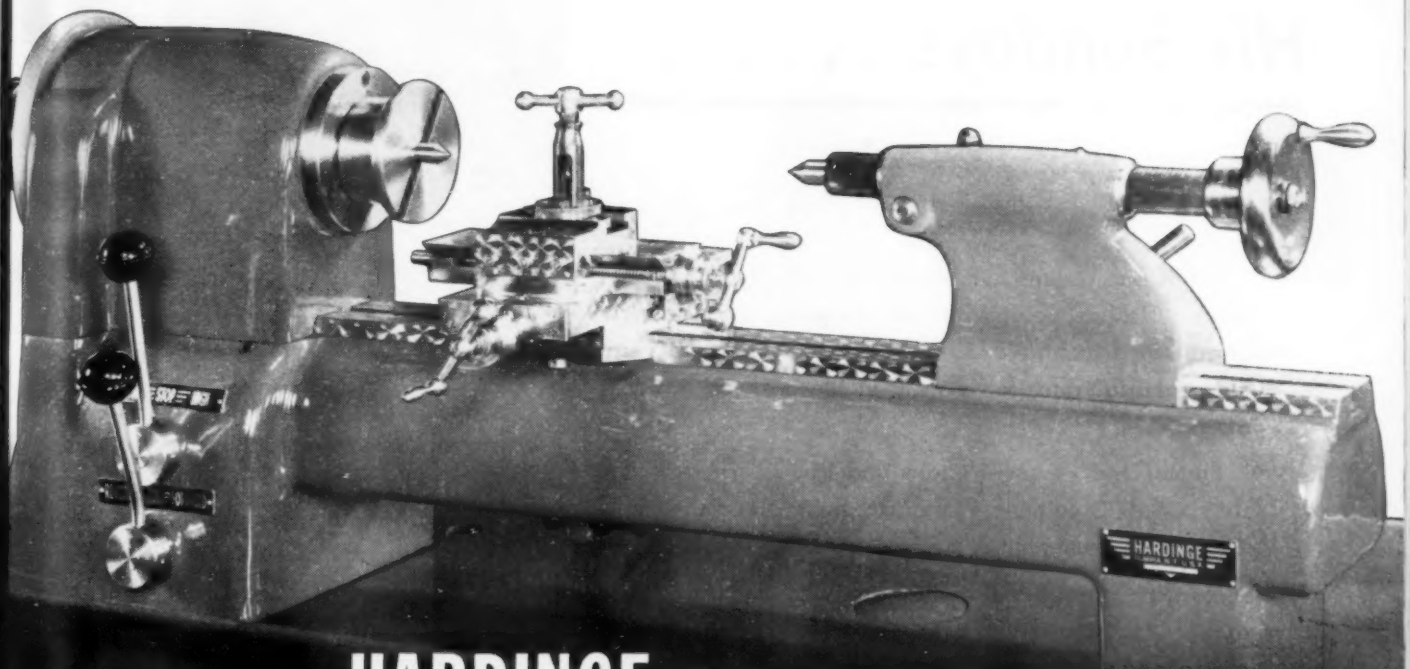
Basically, the FLEXIMATIC is an automatic indexing machine built up of a number of standard specific operation units in such a way that *all* operations can be performed in a single chucking of the work. By the Kingsbury-pioneered FLEXIMATIC method, unique, flexible and versatile machines are available not only for fast, accurate production but also for quick set-up and convenient change-over.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U.S.A.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.



HARDINGE High Speed Precision Lathe

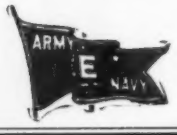
SPECIFICATIONS:
1" collet capacity, 9" swing, 16" center distance, sixteen spindle speeds from 27 to 1750 R.P.M.

Designed to meet requirements of extreme lasting accuracy, high spindle speeds and the ease in operation required for the smaller diameter work range found in every tool room, laboratory and production department.

The simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling. Your larger, expensive equipment will not meet all of the foregoing requirements necessary for practical results and proper economy.

Because of the many advantages found through actual use, Hardinge Precision Lathes are being installed in increasing numbers.

Ask for this 8 page bulletin which gives full details.



How Bob Spends His Sundays . . . . . .

BOB ON THE JOB

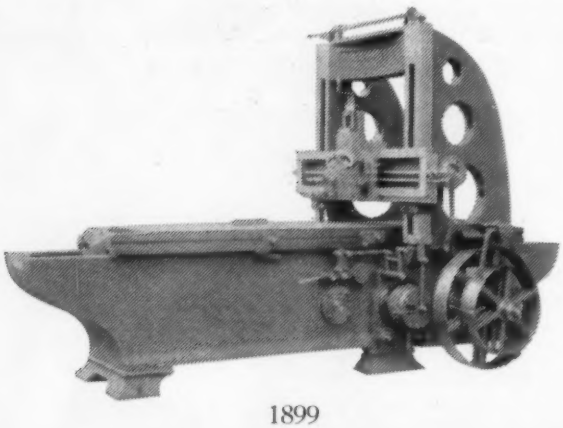
Bob is one of the Cincinnati Planer Company's engineers. He has been with this company more than a quarter of a century. He enjoys taking his two year old granddaughter for a walk in the park on Sunday afternoons.

But instead you will likely find Bob in the drawing room of the Cincinnati Planer Co., long after other men have gone home.

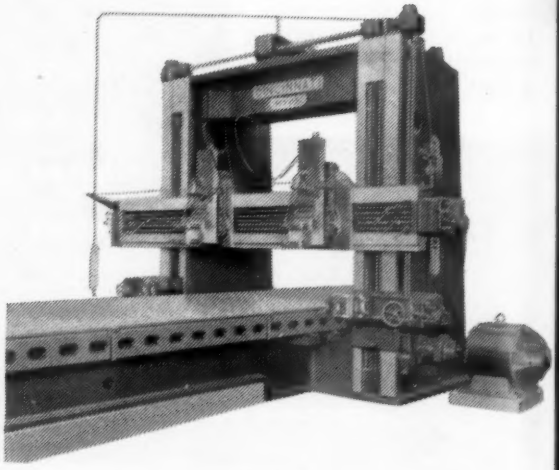
Now it's a fact that Bob doesn't have very many calls about Cincinnati Hypro Planers, Vertical Boring Mills or Planer Type Millers. Many a Sunday goes by without the phone tinkling even once for him.

But if you owned a machine tool—even one of the first planers we built back in 1899, and it broke down while planing parts for the Army and Navy, you would want service. And that is precisely why Bob is here.

Your machine tool may be 44 years old and need a rest. But just the same, Bob looks up the print of the part needed and shoots it down to the shop for production, or identifies a part in the stockroom that will get your machine cutting metal again quickly.



1899



1943

THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

DE WALT

CUTTING MACHINES

help put them in action!

Speedy, tough, maneuverable—the jeep has taken its place as a highly important cog in America's war machine. Helping to deliver jeeps and other war vehicles faster—are DeWalt Cutting Machines. These machines, introducing many new methods of cutting, enable manufacturers to save man power, increase volume and handle fast cutting jobs with an accuracy heretofore unknown.

DeWALT PRODUCTS CORPORATION

18 War Production Men report what happened *when lighting was improved*

GREATER ACCURACY

SHELL FUSE manufacturer: Production increases of from 25 to 50 per cent as result of better inspection and more efficient machine operation.

MOTOR TRUCK manufacturer: Workmen read micrometers and scales more accurately.

TEXTILE manufacturer: Better Lighting a great aid in color matching.

LESS SPOILAGE

ROLLER BEARING manufacturer: Grinder operators spot improper grinder performance more quickly and can correct it before work is spoiled.

ELECTRICAL EQUIPMENT manufacturer: Better lighting accompanied by five per cent reduction in errors.

FACTORY OFFICE: Reduction in office errors as result of lighting.

FASTER SEEING

HEAVY MACHINE TOOL BUILDER: Better lighting reduces time required to rebuild a machine.

ELECTRICAL EQUIPMENT manufacturer: Time required for machine set-ups reduced.

AIRCRAFT PARTS manufacturer: Less time lost by workmen hunting for tools.

EASIER SEEING

LAMP manufacturer: Time for training new women operators greatly reduced.

SMALL MACHINE PARTS: Men can read scales and blueprints more easily at night than by daylight.

FACTORY OFFICE staff: Unable to keep up with increased work under old lighting, but now work is done without undue effort.

INCREASED SAFETY

ORDNANCE PLANT: Increased safety, especially when breaking in new labor.

SHIP BUILDER: New lighting reduced blinding effect of flashes from welding torches.

TEXTILE manufacturer: Decreased fire-hazard.

DECREASED FATIGUE

MACHINE PARTS manufacturer: Men on night shift gained weight.

AIRPLANE PARTS manufacturer: Morale improved; fewer yard fights.

AIRPLANE PARTS manufacturer: Fewer headaches; aspirin tablet consumption decreased from 1000 to 600 tablets per month.

War Production Executives!

The 18 comments summarized on this page are typical of the wide range of benefits resulting from lighting improvements.

Lighting may seem like the least of your problems. But it may be the answer to some of your *other* problems. We'd like to take the lighting problem off your shoulders, by sending a Wartime Lighting Counselor to check the seeing conditions in your plant and get the most out of *present* lighting equipment.

Call your nearest G-E lamp office. Or see your G-E lamp supplier or your electric service company. General Electric, Nela Park, Cleveland, Ohio.

These reports are the result of a survey of war plants made under the direction of a special committee of the Illuminating Engineering Society, a non-profit professional organization of the nation's leading lighting authorities. Interviews were made by teachers of illuminating engineering of five leading technical colleges.

G-E MAZDA LAMPS

GENERAL ELECTRIC

Tune in the G-E MAZDA lamp radio program Sunday at 10 p.m. (Eastern War Time) N.B.C.

Freedom OF THE PRESS

Never again need production plans be limited by pre-war notions of what industrial presses could do. Even before the war, freedom of the press was demonstrated by Clearing Presses doing jobs never before performed by presses.

Since the battle of production started, the Clearing organization has been responsible for entirely new concepts of the capabilities of presses. Hundreds of vital parts for implements of war were produced, *on time*, because of the engineering skill, ingenuity and production facilities which Clearing brings to press manufacture.

Facts about more efficient, faster and better production methods are important now and will be valuable when planning for the future. So even though you think presses cannot solve your problem, remember that old ideas of the scope of press operations are no longer valid — when Clearing builds the presses.

CLEARING MACHINE CORPORATION
6499 W. 65th Street, Chicago, Illinois

20 mm. cartridge cases are drawn in this Clearing single action press which brings speed, accuracy and a high production rate to this important operation.

CMC CLEARING

FOR SHAPES OF THINGS TO COME

CLEARING

MECHANICAL AND HYDRAULIC PRESSES

Precision IS "BUILT IN" . . .

SPRINGFIELD GEARED HEAD LATHES

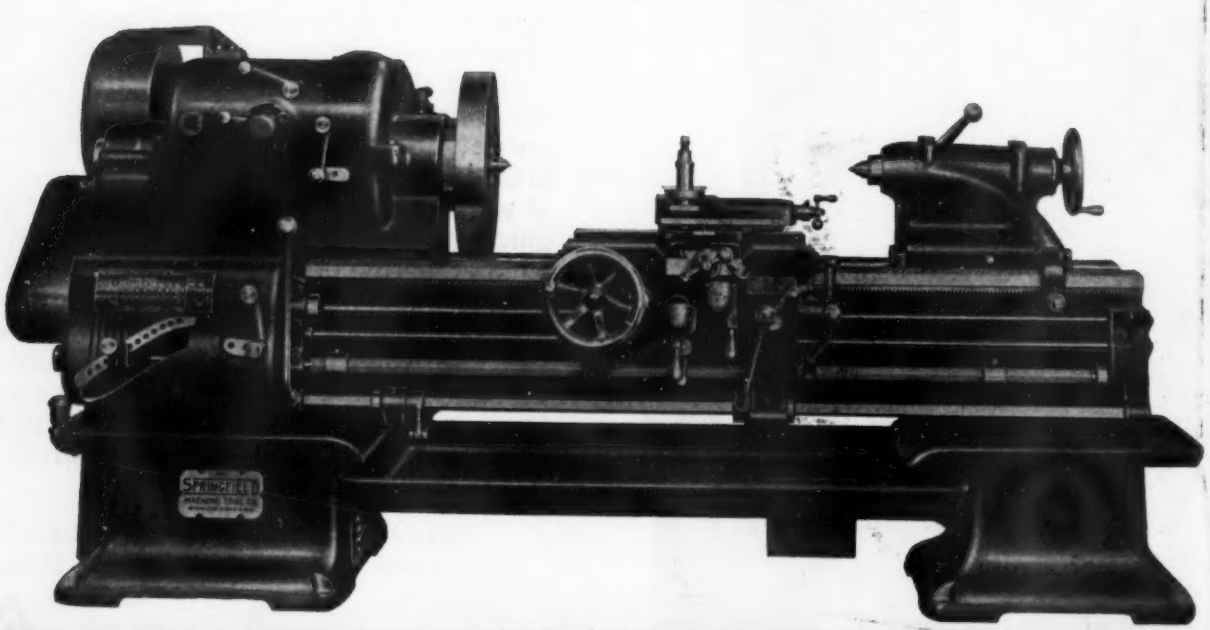
• For years all castings going into Springfield Lathes have come from our own foundry. Made of High Test Nickle Chrome Gray Iron we have found this material both from laboratory tests and actual operation to be best for lathe beds and other units. For example, a lathe in our own shop that has been in operation for more than 15 years was checked recently and ran out but a scant .003 inch in 10 feet.

Other users are having equally successful operation and maintaining high precision year after year.

Consult Springfield on your lathe needs.

Sizes from 14" to 30".

Write for deliveries, prices, etc.



The SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD OHIO U.S.A.

Special

CARBIDE TIPPED TOOLS

For Machining of

STEELS, CAST IRON, BRASS, BRONZE, ALUMINUM, AND NON-METALLICS

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Write today regarding your requirements

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METRO PRECISION TOOLS AND GAGES MADE IN A MODERN PLANT BY MODERN METHODS

Send for our booklet on Standard Carbide-tipped Tools carried in stock.

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TOOL AND GAGE CO.

4240 PETERSON AVE.

CHICAGO, ILL.

DRILLING MACHINE!
COLBURN
COLBURN
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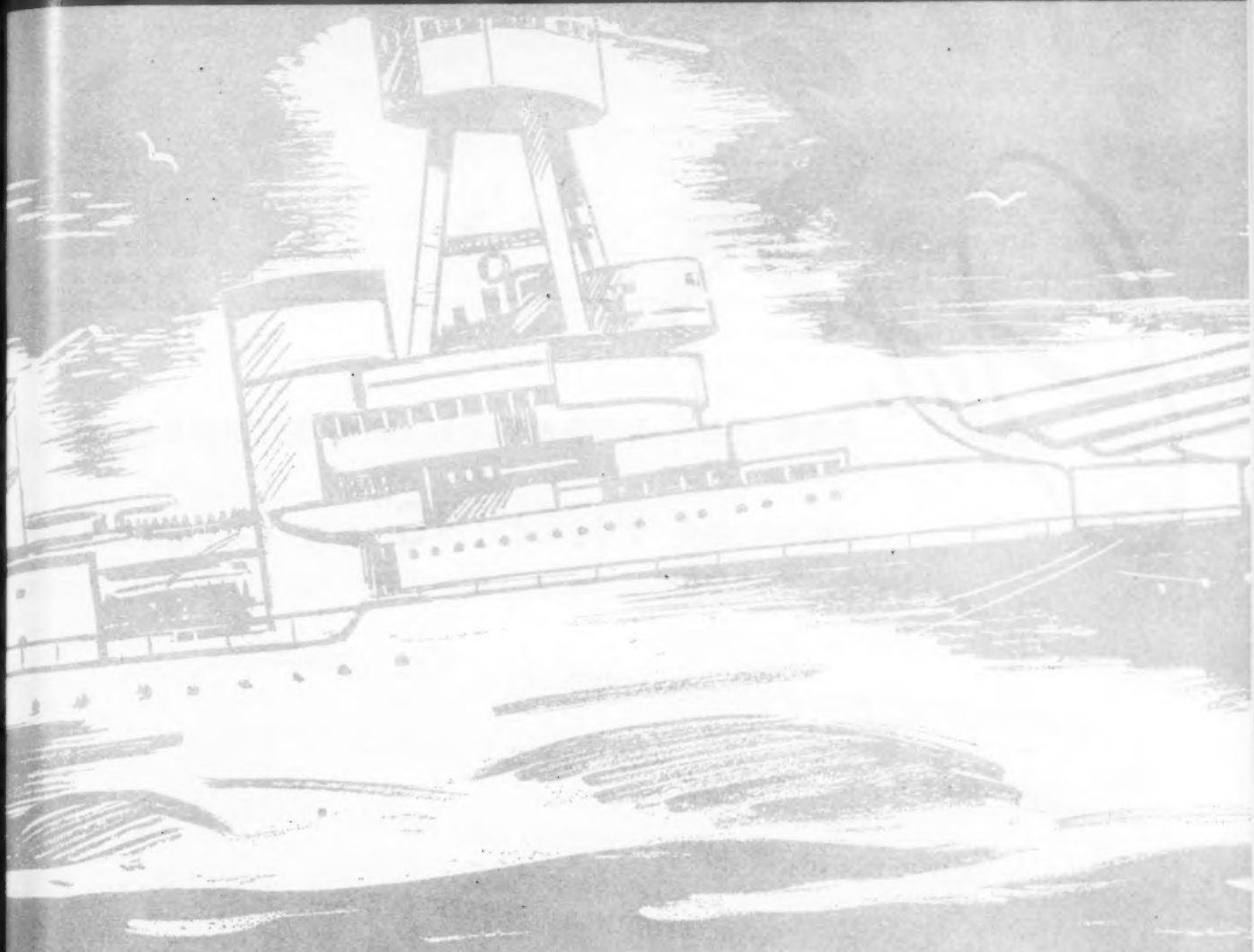
COLBURN ARMOR BOLT



TOUGH jobs like drilling and tapping 6" holes in heat-treated steel armor plate require tough machines like the 150-ton giant shown on the opposite page.

This Universal Drilling and Boring Machine was made by Consolidated espepecially for this type of work. It's a brute for strength—built to handle the toughest assignments and ask for more! A number of these machines are performing valiant service to our Victory program by greatly facilitating the manufacture of armor plate for battleship construction and for gun turrets.

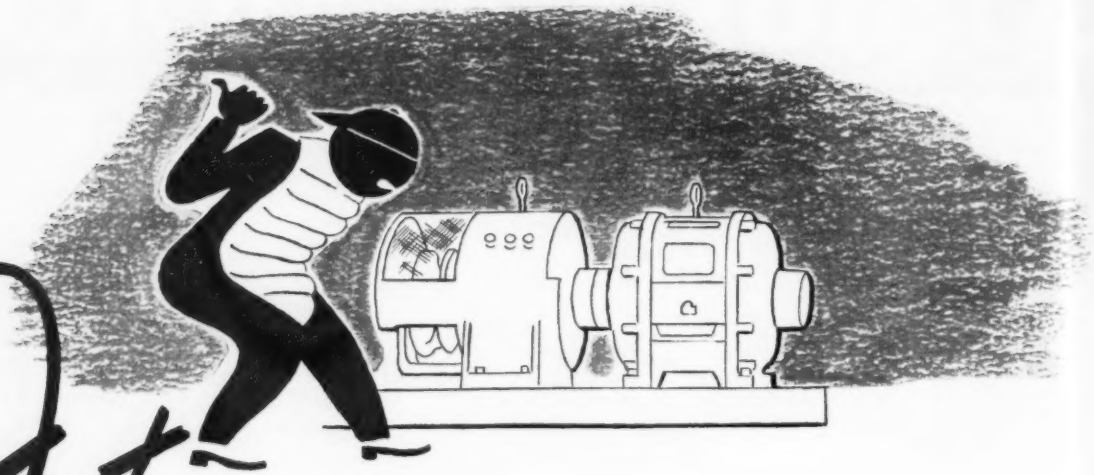
Machine tools like this are typical of Consolidated skill and craftsmanship. If you have a special machine tool problem, we would be glad to work with you on its solution.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED

MACHINE TOOL CORPORATION

ROCHESTER NEW YORK



Out FOR THE DURATION ON WEDNESDAY

BACK IN "PITCHING" ON SATURDAY

PRODUCTION OF 3" SHELLS THREATENED 9:00 A.M. WEDNESDAY.

BROKEN DOWN 50 KW. MOTOR GENERATOR SET DELIVERED TO

WESTINGHOUSE DISTRICT MANUFACTURING AND REPAIR PLANT.

CLEANED, TREATED STATOR WINDINGS. REPAIRED ROTOR RESISTOR.

CORRECTED GROUNDED COIL. INSULATED AND TREATED FIELD COILS.

ASSEMBLED, TESTED AND DELIVERED SATURDAY, 11:00 A. M.

Westinghouse

DISTRICT MANUFACTURING AND REPAIR

J-90464

***IF* THE EQUIPMENT NEEDING REPAIR IS VITAL TO THE WAR EFFORT . . . PHONE THE NEAREST OFFICE OF WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY FOR**

EMERGENCY SERVICE

33 M & R PLANTS . . . ONE NEAR YOU!

DON'T GET CAUGHT OFF BASE

BY IMPROPERLY GRINDING CARBIDE TOOLS

Carbide tipped tools are entirely too expensive to neglect. To operate at peak efficiency they must be kept well sharpened at all times. That means frequent grinding—removing only a few thousandths each time. And grinding carbide tools is no job for an amateur.

The danger of localized heating, cracking, chipping or otherwise ruining a costly tool is greatly lessened when a MID-WEST "B" Bond wheel does the grinding. You'll find MID-WEST "B" Bond wheels cut faster, cooler and smoother because they are engineered especially for carbide grinding. Any grade. Any grain. Porous or dense. And reasonably prompt delivery.

Order "B" Bond Wheels Today—

AND WATCH YOUR TOOL LIFE LENGTHEN

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. MILWAUKEE AVENUE **DETROIT 11, MICH.**

"PUT IT ON THE BLANCHARD"

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

★ **Production**

Adaptability

Fixture Saving

Operation Saving

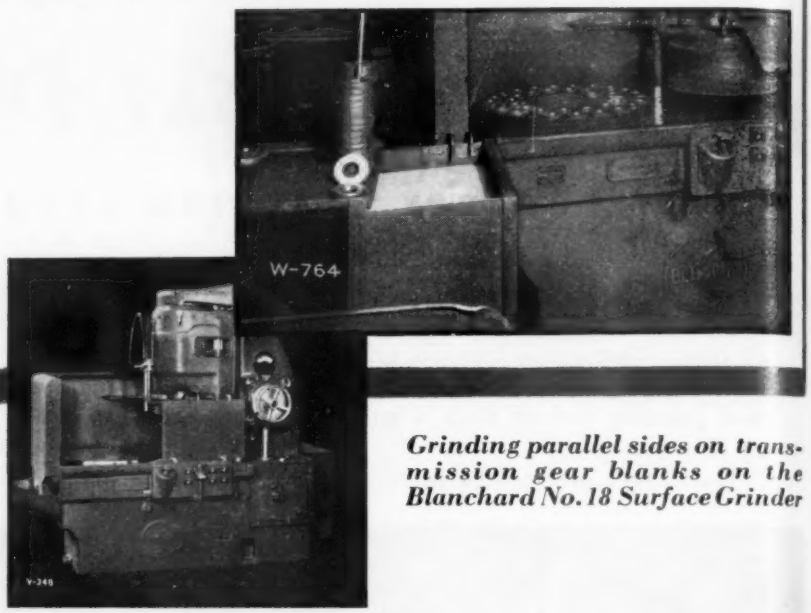
Material Saving

Fine Finish

★ **Flatness**

★ **Close Limits**

★ . . . . . *Especially valuable on jobs like the one illustrated.*



Grinding parallel sides on transmission gear blanks on the Blanchard No. 18 Surface Grinder

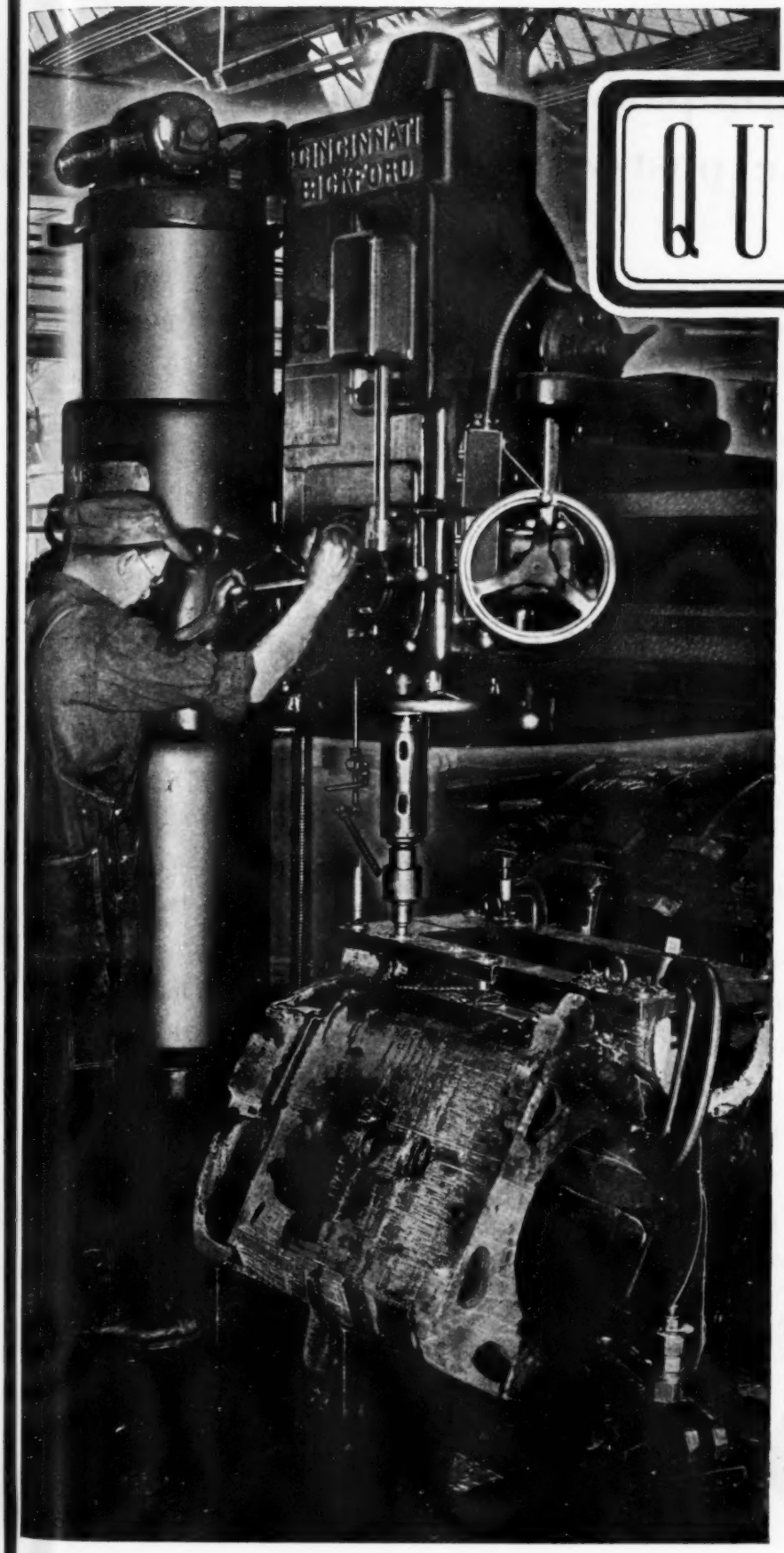
THE transmission gear blanks, shown above, are ground on a Blanchard No. 18 Surface Grinder. They are held on the 30″ Blanchard magnetic chuck. The blanks are 3½ inches in diameter and are made of forged alloy steel. .020 inches of stock is removed from each side to limits of .0005″ for parallelism. Blanchard Grinding produces accurate blanks that stack and cut well—and produces them at a rate of 250 (500 surfaces) per hour.

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



QUALITY

YOUR ONE SOLID ASSURANCE OF SPEED AND ACCURACY FOR WAR PRODUCTION

Illustrated is a typical application of the SUPER SERVICE RADIAL to wartime production. The job calls for operations on motor frames for Diesel-electric switcher-engines . . . vital jobs, because the War Department, the Navy Department, Arsenals and many large manufacturers require these engines to speed essential transportation. For work of this character the SUPER SERVICE RADIAL is almost a standard. You'll find these famous Radials on the job, 3-shifts-per-day, 7 days a week, in countless war production plants from coast to coast. The Quality of their design—the Quality of their workmanship and construction—the Quality of their performance is such that the name "Cincinnati Bickford" on a Radial is sufficient to assure top operating speeds, unexcelled accuracy and "more holes per dollar".

THE CINCINNATI BICKFORD TOOL CO. OAKLEY, CINCINNATI, OHIO, U. S. A.

Why every company has an obligation to make post-war plans now

SOME people think post-war planning now is somehow unpatriotic, premature, the wrong use of time.

The government doesn't think so. They are working on demobilization plans, conversion to peace, and yet not letting it interfere with prosecution of the war. Everyone can and should do the same, because . . .

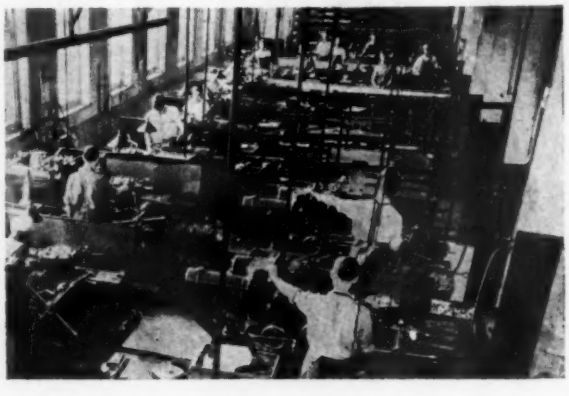
What sort of welcome will it be for our soldiers if they come home to closed factories, with "No Help Wanted" signs —factories shut down while they're being converted to peacetime products?

As part of its post-war program, every factory should plan on providing as many good jobs as possible for efficient workmen. To provide good jobs, a factory will have to compete successfully in the peacetime world. To compete successfully means you must provide goods at a cost low enough to attract buyers. To keep your costs that low means you must provide your workmen with every possible means of eliminating waste and keeping down cost-per-piece. And that means the most efficient machine tools possible.

Plan now, and set aside the dollars, for the new Warner & Swasey Turret Lathes and other machine tools you'll need to keep your post-war costs low. Modern Warner & Swaseys can cut turning costs as much as 50% below many old-time rates. That means broader markets for your goods; and *that* means you'll provide more post-war jobs. Right there is reason enough to do your post-war planning *now.*

YOU CAN TURN IT BETTER, FASTER, FOR LESS... WITH A WARNER & SWASEY

WARNER & SWASEY Turret Lathes Cleveland



WHAT'S IN THIS ISSUE

R. B. PARKHURST

FEEDING THE LINE

Aircraft assembly lines form a dramatic picture of industry's contribution to the war. But such lines are useless unless backed by manufacturing departments that insure a scheduled flow of parts and materials to them. R. B. Parkhurst, chief industrial engineer, Consolidated Vultee Aircraft Corporation, tells how the feeder departments at the San Diego Division are arranged to reduce needless work handling and thus permit the smooth passage of materials through them. Page 91.

WHEN THE DRAFT TAKES DRAFTSMEN

Eastern Aircraft Division of General Motors is drawing women college graduates into war work through intensive training courses, designed to fit them for employment as artists, draftswomen, tool designers and junior engineers. Excellent results have attended the 90-day courses given them at Rutgers University, and many graduates have been fitted successfully into positions not foreseen when the plan was first conceived. These courses have been drawing women from a heretofore untapped reservoir. Page 99.

UNTOUCHED BY HUMAN HANDS

Hand sorting swept-up rivets at the Nashville Division, Consolidated Vultee Aircraft Corporation, proved to be more costly than purchasing new ones. Yet, since the aluminum alloys from which the rivets are made are strategic materials, it was essential to continue to salvage and return to stock as many of them as possible. To do this quickly and economically, Vultee production and tool engineers developed two different types of automatic sorting machines: one to sort for shank diameter, one for length. With these machines in use, the only hand work now necessary is the removal of damaged rivets. Harold O. Mills and Ludwig Donner, of the Nashville Division, describe the sorting machines and give detailed statistics of their construction. Page 105.

LAKE CITY SAVES THE TOOLS

In a plant mass-producing millions of parts with gage-like precision, it is highly essential that machine downtime be kept at an absolute minimum. Hence, tool life must be increased to as great an extent as possible. Such has been the problem of the Lake City Ordnance Plant, which has established an excellent record for increasing tool life, while carrying on a well planned tool steel salvage system. A four-page article describes the tool conservation and salvaging activities of this plant. Page 109.

D. C. STEWART W. F. OCENASEK

TUNNEL-TYPE DRILLING

A four-fold gain in production in drilling aircraft subassemblies has been realized by the development of tunnel-type equipment consisting of overhead rails upon which radial drill heads are mounted. D. C. Stewart, assistant master mechanic, Linden Plant, Eastern Aircraft Division, General Motors, and William F. Ocenasek, chief engineer, Walker-Turner Company, outline the various ways in which this equipment can be fitted into production lines. Page 100.

R. R. VALVE RINGS

Most railroads make valve rings in their locomotive shops as the need arises for various classes of repairs. One system, however, has centralized the manufacture of these parts. One machine tool is employed continuously in turning out these rings with resulting economies. A novel feature of the process is the method of slitting the rings before turning and boring. Page 96.

HANDLING PLASTICS

Plastic rod mars easily if not handled properly. A good way to do it is described in one of a series of kinks for the small shop. Page 95.

THAT'S AN IDEA

Among the new ideas shown in this number is one for locating a jig quickly under the drill spindle. Other Ideas From Practical Men give timely help to large and small shops. Page 102.

ABOUT TURNING

Lathe operation is the subject of our current section, "Tools of Our Trade." This down-to-earth instructive material has created a great demand for reprints which shows that it is being put to work to good advantage. Judging from previous experience with these sections, this one on engine lathes should be very popular. Page 113.

COMING

Recently we ran an article on steel cartridge cases—the process that has saved thousands of pounds of precious copper. We have another story coming on the subject covering an alternate method of accomplishing the same result. It is based on the practice developed by Corcoran-Brown. Look for it soon.

Efficient cutters are now being used with cast bodies and cemented carbide tips. A forthcoming article will tell something about brazing practice and sharpening angles for best results. The performance of actual set-ups will reflect the practical merits of the cutters in shop use.

The War Manpower Commission has worked out a plan for utilizing peacetime skills and aptitudes for war work. A locksmith is now working as a skilled lathe hand; a sculptor makes plaster patterns for Kirksite dies. Some of the conversions of skill are not so obvious but all are based on manual dexterity and former work habits. The story forms another chapter in the better use of manpower.

THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS BRAKES SHEARS

This 3/4" by 14-ft. Shear is typical of the Cincinnati line with capacities of 1¼" in thickness, 18-ft. in length, and capable of handling the toughest of materials . . . armor plate. These powerful Cincinnati All-Steel Shears . . . built like a machine tool and equipped with exclusive Cincinnati hydraulic holddowns . . . shear with micrometer accuracy.

Write for informative book S-3 on the complete line of Cincinnati Shapers.

ESTABLISHED 1877 AMERICAN MACHINIST BURNHAM FINNEY, Editor

Behind the Assembly Line

BY R. B. PARKHURST, CHIEF INDUSTRIAL ENGINEER, SAN DIEGO DIVISION, CONSOLIDATED VULTEE AIRCRAFT CORPORATION

A fine layout shows aisles and receiving areas plainly marked. Opening up a department like this does not necessarily mean additional floor space; usually the elimination of useless furniture will do the trick. The results are a drastic reduction in man-hours per unit and a steady rise in the number of fighting ships delivered to our air forces

IF HITLER could see the steady flow of great four-engined bombers rolling off one of our final assembly lines, he would feel even worse than he does now. The glamor spots of aircraft production, these final assembly lines have been given the largest share of praise in words and pictures because of the sheer drama in their size and movement.

Behind the final assembly lines, however, are the less publicized but equally vital feeder departments. These supply the parts and small subassemblies that make the progressive assembly line possible. Unless materials flow through them smoothly on a rigid time schedule, the assembly lines are starved for parts and, being thrown out of balance, they become detriments rather than aids to efficient production.

Feeder departments supply the parts that make progressive assembly possible. Unless materials flow through them smoothly the whole system will be disrupted

In terms of over-all production, the feeder departments are also important because they consume a large percentage of the total man-hours needed to build each completed plane. For that reason, they offer the greatest opportunity for the saving of time. They

Crowded aisles and inaccessible work stations cause repeated handling of materials within the same department. As rearranged, the same department permits placing skids of incoming material close to the operating area

are the points at which efficiency is established or lost.

Analysis of parts manufacture and subassembly fabrication invariably show that more time is consumed in handling material than in performing productive operations. Even after the material has reached the department, time studies in a typical aircraft plant have revealed that over 70 percent of the time spent on it is devoted to handling. Although some of this handling time is necessary, much of it is avoidable duplication.

It is, therefore, readily apparent that departmental rearrangement to reduce nonessential material handling will yield large returns in decreased production costs. Aside from the lowered costs, the savings in man-hours alone are vital. Faced with a serious manpower shortage, it is imperative that the American aircraft industry produce many more planes with far fewer men.

Feeder departments at the San Diego Division, Consolidated Vultee Aircraft Corporation, have recently been rearranged and overhauled with remarkable savings. To cite an example, smooth flow of material and the elimination of backtracking have contributed to a 60 percent reduction in man-hours on the four-motored Liberator (B-24) bomber. The improvements were made without the installation of elaborate mechanized material handling equipment. Simple, standard units were used throughout.

From the start of the war, the San Diego plants of Consolidated Vultee, like most already established producers of war planes, have had to meet a succession of increased production schedules. These have necessitated a series of plant and department expansions which had to be made while current production continued uninterrupted.

As the departments grew in size, they tended to become congested. More employees and more material were crowded into a given area. Aisles became narrower and working areas restricted. Long rows of benches placed close together permitted little opportunity to get material to and from points of operation.

Long trailer trains were employed to transport work between departments, making it necessary to load and unload at each move. Often the material was unloaded at a point some distance from the work station. This required that it be carried to the machine or bench by hand. Working areas became storage areas, cluttered with materials that hindered bench and machine operations. All of this created confusion and inefficiency within these departments.

In order to protect himself from stock shortages, a foreman would often provide private storerooms for stock parts and supplies. Cupboards and other furniture accumulated. These used up valuable floor space while contributing nothing to the manufacturing operations.

Such conditions come about so gradually that they often pass unnoticed. The excess accumulation of benches, racks, cribs and miscellaneous handling equipment appears essential, and the repeated handling of parts becomes so much of a habit that its wastefulness becomes routine.

Consolidated Vultee industrial engineers approached the problem of rearranging the feeder departments with one primary purpose in mind: to set up each department to obtain the full and unrestricted use of the three basic elements of production—men, materials and machines. Mass production is the result of complete and unhindered utilization of these three elements.

To achieve this primary purpose required the segregation of the various

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In the proposed revision of any produc... area layout, or in any proposed chang... equipment location, the project was ... quired to satisfy the demands of five q... tions. They were:

1. Does it provide for the movement ... material directly to the operator?

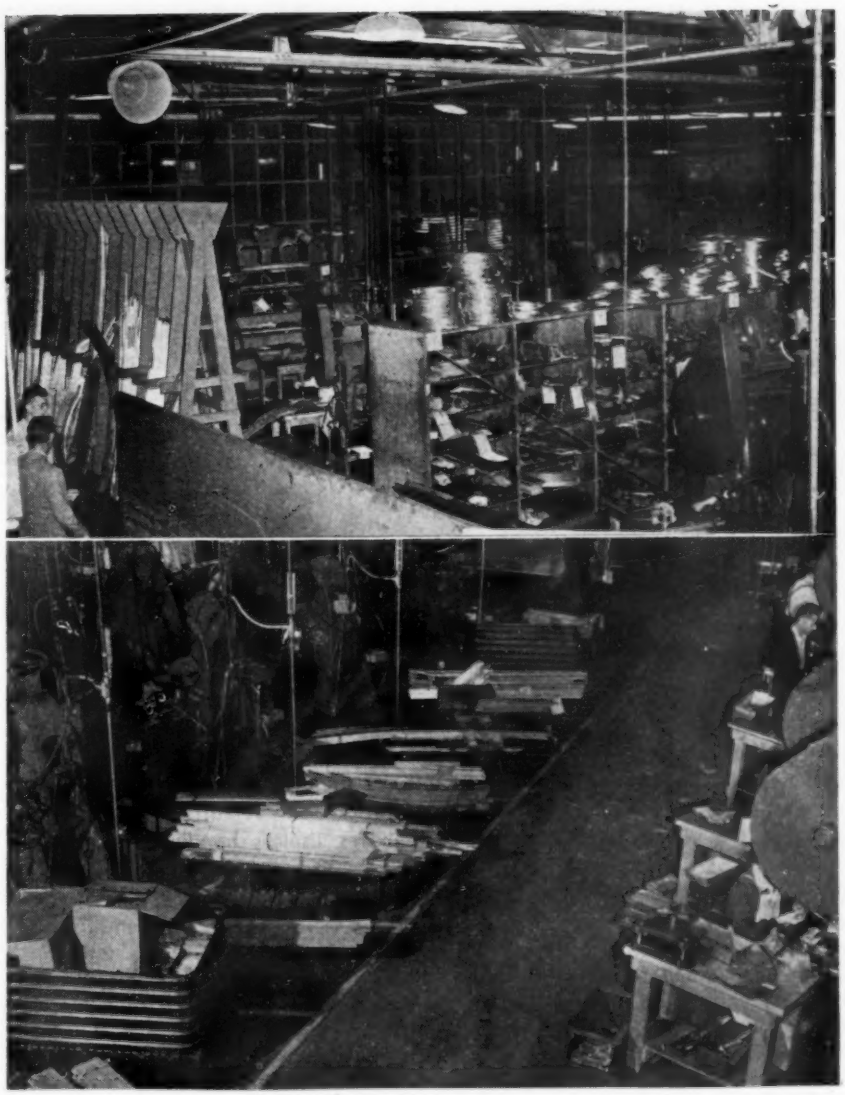
2. Is the arrangement at the operat... work station so planned as to eliminat...

production facilities into two classes, one major and one minor. The major class incorporated men, materials and machines. The minor group included such essential accessories as benches, racks, cribs, stockrooms, washrooms and offices.

Any equipment that did not contribute directly to the bringing together of the three major production elements was questioned. If possible, it was eliminated. In fact, a good share of the improvement in operating efficiency was achieved by the elimination of non-productive facilities from the department where their need was questionable. In most cases it was found that production was improved immediately by the removal of these facilities. In only rare cases were any additional facilities required.

In surveying the plant as a whole, it was found that many foremen had literally built a wall around their departments to prevent their use as passageways. In so doing they kept unwanted people out, but they also hampered the smooth flow of incoming material. The material handling problems thus created grew in magnitude as production expanded.

The first step in rearrangement was to create a master plan of department locations in terms of the efficient flow of parts and subassemblies from raw materials to finished units ready for the assembly lines. Since many of the departments had simply grown into their existing locations, backtracking had become commonplace. In tracing the routes of individual parts and subassemblies, it was discovered that some of them traveled well over a mile, with a multiplicity of moves, before they were completed. These same parts and subassemblies may now travel no more than 50 ft. under the new plan of flowing in a direct line to their final assembly, and the number of moves has been reduced to the bare essentials.



Between work racks and a board fence, this department has built a Chinese wall around itself. Throwing out useless furniture resulted in open aisles so the presses could be readily supplied by powered shop trucks

Departments have been opened up to permit the passage of shop trucks to the point of machine or bench operations. The opening up process does not necessarily mean an expansion of floor area. In most cases, it was only needed to make better use of existing space by throwing out non-essential cupboards and storage racks.

In place of these localized, unofficial storerooms, planned accumulation areas have been established at the beginning and the end of parts manufacture. These areas perform the "banking" function of accounting for the raw materials and supplies before they enter the manufacturing processes, and of collecting and counting them before they proceed to the assembly processes. The accumulation areas thus perform an important function in materials control, and eliminate repeated individual checks on each operation.

The old trailer trains were discarded in favor of a few simple types of material handling equipment. The powered lift truck is used because it can pick up skids and deposit them at accumulation points, or take them directly to the operator, without manual handling.

The aisles are made wide enough for these trucks to enter and deliver materials within reach of machine operators. The floor area is blocked out with yellow paint so the exact spot for incoming and outgoing skids is definitely fixed, as well as placed on 45-deg. angle to the aisle. This 45-deg. angle of pick-up and deposit permits the trucks to operate in a much narrower aisle than would be feasible if a 90-deg. angle were employed.

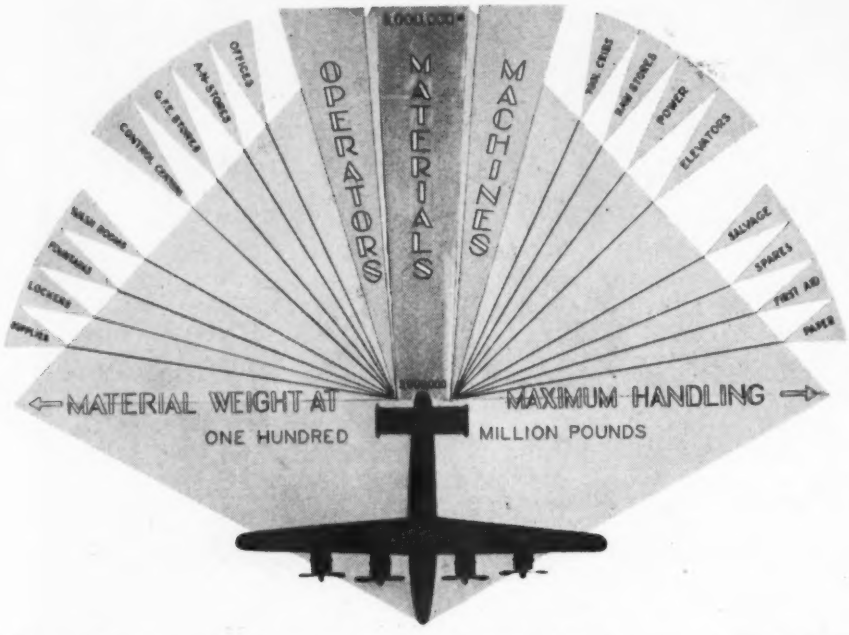
The skids themselves have been standardized. One type has a flat top to carry tote boxes or cartons of parts.

necessary handling motions and move-ents by the operator or the moveman?

3. Can the materials be handled as a t load to and from the work station hout manual handling?

4. Does the layout help to eliminate ngestion within this department?

5. Has an accumulation area been pro-ded as an incoming and dispatching tion.



Five million pounds of material entering the plant became three million pounds through the reduction in weight in processing; but meanwhile the equivalent of one hundred million pounds is handled because of repeated moves of the same material. Concentration on essentials — operators, machines and materials—eliminates useless handling

Another has a tub to handle larger parts and to carry scrap away from machining departments. Long pieces that cannot be handled by either of these skids are carried on dollies that can be towed from one location to another.

If several operations are done in one department, the skids are moved by a hand-lift truck from one point to another, thus keeping the powered trucks free for the longer moves.

The rearrangement program is not one that has been thought up by a few experts and superimposed upon the shop. Every foreman and his assistants have been made a part of the program. A series of courses on the control of production have been used to demonstrate to the supervisory personnel that this control does not depend on an elaborate system of paper work but upon the department's ability to obtain unrestricted use of its production facilities.

The courses emphasize that no system, or follow-up, will work unless the physical arrangement of the department permits smooth operation. Good production control, it is shown, is not merely a matter of drawing a flow design on paper, but is readily apparent visually in the work of the department itself.

The course in production control have made foremen and their assistants partners in the general plan of improvement. Once they see the objective of the plan, they become enthusiastic supporters and a prolific source of ideas for putting it into effective operation. As their departments are opened up and they see the materials beginning to flow through them smoothly, they guard the passageways and resist any attempt to clutter up working areas.

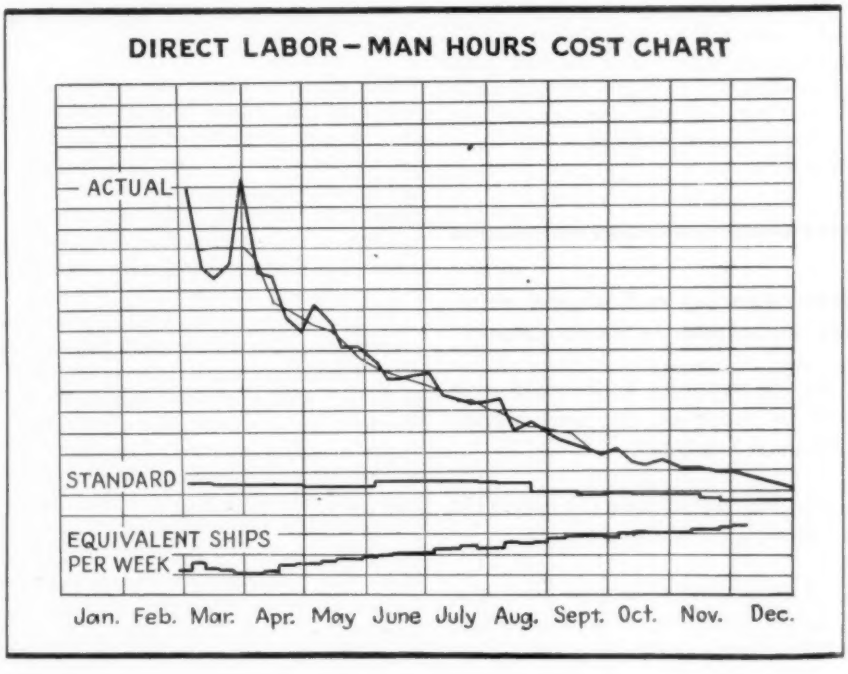
Another noticeable result of the rearrangement of feeder departments is the improvement in the morale of machine operators. Given good tools and a free flow of materials, the average operator tackles the job with a will and makes a good showing. Disrupt his activities by forces beyond his control, and he learns to mark time. This is both demoralizing and habit forming.

Well planned and executed operation also builds respect for the supervisors and foremen in the minds of their workers. Feeling they are working under competent management, the workers pitch in and do their share. Increased production, reduction of absenteeism, all evidences of a better attitude toward their jobs, are direct results of lifting artificial restrictions on output.

Once the general plan of work flow has been smoothed out, the individual worker takes increased interest in his immediate operation and himself devises means for improving it. As a result of installing the general plan, the operations at each work station are improved through suggestions from workers, foremen and their assistants.

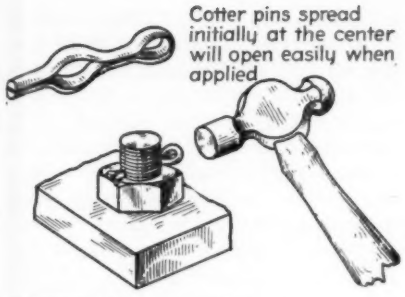
All of these factors operate to speed up the flow of materials to large subassembly and final assembly lines. With reduced shortages, each assembly station operates at peak efficiency.

Freed of bottlenecks, the whole system of production moves along as planned instead of by a series of time-consuming compromises caused by improper work flow.

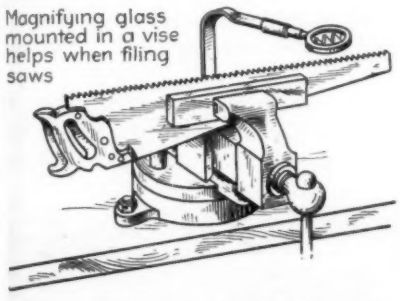

DIRECT LABOR—MAN HOURS COST CHART
ACTUAL
STANDARD
EQUIVALENT SHIPS PER WEEK
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

SHORT CUTS FOR THE SMALL SHOP

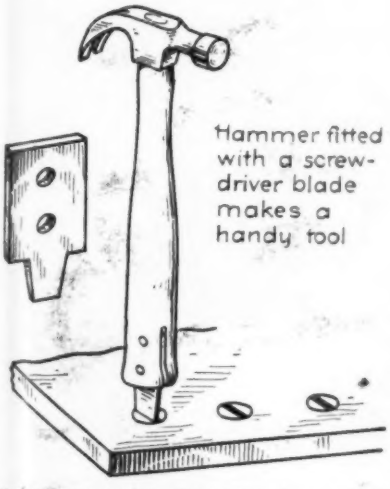
BY A. H. WAYCHOFF



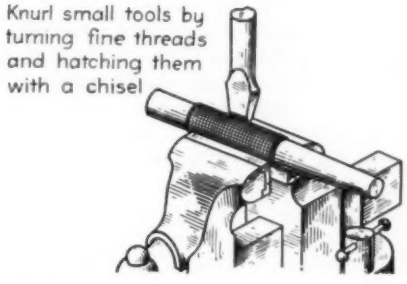
COTTER PINS opened at the center before application will spread automatically when driven through bolt holes. Use this when the ends of the cotters have to be spread at inaccessible places. Further spreading is made easier when the ends are opened initially by this method.



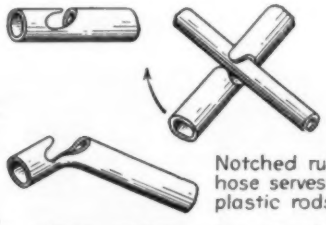
SAW FILING can be facilitated by mounting a small magnifying glass on a piece of strap copper so bent that when clamped in the vise with the saw, the enlarged teeth can be seen by the filer. Tin or sheet metal can be substituted for copper, but will not bend as easily or last as long.



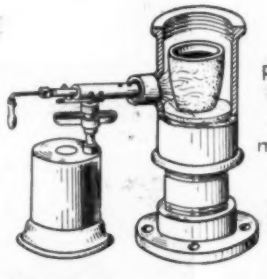
SCREWDRIVER BLADES inserted in hammer handles are a convenience for maintenance men. The blade should be at least 1/16 in. thick, 3 to 4 in. long, and drilled with two 3/16 holes. The hammer handle should be drilled and countersunk before slitting. Make the countersinks deep enough so that the peened rivets can be filed flush with the handle to prevent injuring the hands.



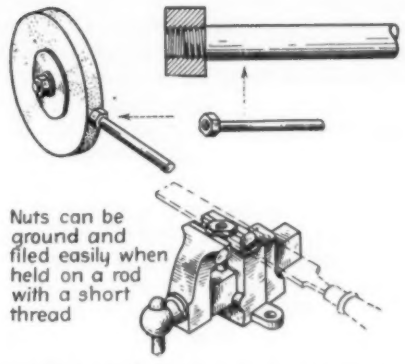
KNURLING on punches and other small tools can be made without a knurling tool. Simply turn fine threads on the handle of the tool, hold it in a vise, and cut the cross horizontal grooves with a chisel.



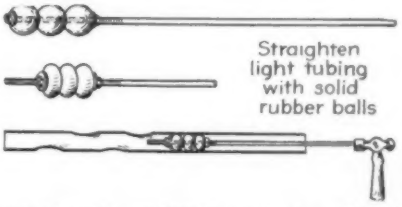
PLASTIC RODS and polished tubing mar easily when handled with pliers or a wrench. Instead of these tools, use a section of notched rubber hose. Bend the hose back to open the throat, apply it to the rod, and pull it around to close the throat. Sufficient pressure can be applied without slippage to tighten such rods into fittings.



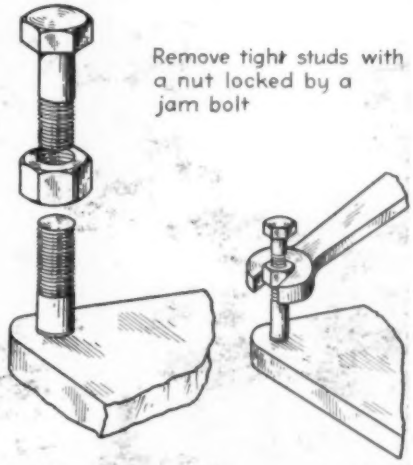
REDUCING Ts 3 in. or larger can be used as a combustion chamber in conjunction with a blow torch to retain heat when melting small quantities of brass, copper or silver and other light metals. A small crucible is placed in or on top of the T, which should be mounted on the bench at a height for the side opening to take the muzzle of the blow torch.



GRINDING NUTS is a hazardous job, but one that is done occasionally. For such work, use a rod with a short thread on which the nut can be shouldered and pressed against the grinding wheel. When filing thin nuts, grip the rod in vise jaws.



STAINLESS TUBING and thin polished pipe are usually mounted in places where they can be dented easily. Such dents can be removed by mounting three solid rubber balls on a threaded rod and driving them through the tubing. When compressed between washers and nuts, the diameter of the balls can be adjusted to suit the size of pipe being straightened.



TIGHT STUDS can be removed without damaging the threads. Run a nut two-thirds of the way on the stud, and jam a bolt on top of the stud. Then back out the stud with a wrench on the nut. For extremely tight studs, make a set of long nuts, each at least 2 in. long.

Railroad Makes Valve Ri

AN EASTERN RAILROAD has centralized the production of locomotive piston valve rings in its main repair shops. The rings are machined from cast gun-iron drums or tubs and are made in diameters from 10 to 16 in. Oversize rings for each diameter are also made, beginning with $\frac{3}{32}$ in. over the nominal diameter of the steam-chest bushings and increasing in step sizes of $\frac{3}{32}$ in. until the maximum diameter of $\frac{3}{8}$ in. over nominal is reached. The steam-chest bushings are rebored when it is necessary to apply oversize bushings, but after the $\frac{3}{8}$-in. oversize rings are used, the bushings are replaced with ones of the nominal diameter.

The castings from which the rings are machined are of sufficient height to produce 18 rings. Each casting has a 45-deg. beveled chucking collar at the base to fit machined chuck jaws on Bullard vertical turret lathes. The vertical component of the radial pressure on the 45-deg. collar wedges the casting down on the parallels carrying the chuck jaws. After the casting is placed on the parallels, a self-centering fixture with three adjustable arms is inserted in the center hole of the table, thus centralizing the casting before tightening the chuck jaws.

Contrary to the usual practice of splitting the rings after machining, the gun-iron casting is first slotted, pulled together with a strap clamp, and then mounted on the table of the lathe for machining. This provides exact concentricity in the finished rings. The rings are turned, bored, faced, recessed and parted from the casting in one set-up on the vertical turret lathe. Finally they are ground on the flat side to a snap-gage size on a Blanchard 30-in. grinder, three rings being held on the magnetic chuck at one time. After being drilled for dowel clearance, the rings are stenciled to indicate their size, oiled as a corrosion preventive, and packed for shipment to storehouse at all locomotive shops and engine houses on the railroad. This manufacturing practice has resulted in maximum utilization of Bullard vertical turret lathes and Blanchard grinders, with a consequent reduction in production costs over that when each shop machined its own rings.

Machine Set-Ups Simplified

The slotted casting is pulled together with a strap clamp to close the slot. After chucking, the casting is faced, and then turned for a distance of about 3 in. from the top. A ring clamp, which is a sliding fit on the rough machined outside diameter, is slipped on top of the casting and tightened

The gun-iron casting is slotted, pulled together with a strap clamp and the top is turned for a ring clamp that replaces the strap when finishing the outside diameter

The strap and ring clamps remain on the casting while it is being rough bored. The packing rings are bored to finish size during a later facing and parting operation

Rings in One Shop

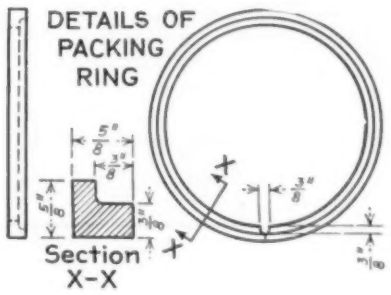
thereon with eight setscrews. This maintains the casting in a closed position after the removal of the strap clamp and leaves the lower portion of the casting clear for turning completely to the base, simultaneously, the casting is bored. After this operation, the strap clamp is again applied and the ring clamp removed preparatory to facing, recessing and parting the rings from the casting. As the tools for these operations approach the strap clamp, a second strap clamp is applied below the first one, and the position of the two clamps alternated as needed until all the rings have been parted from the casting.

The casting is rough turned and bored with Stellite tools at a surface speed of 80 ft. per min. and a feed of 0.068 in. per revolution. Finishing with a flat Stellite tool is done at 80 surface ft. per min., and 0.083 feed per revolution. When setting new or ground tools in the turret and side heads for finishing operations, a gage is clamped to the toolholder and the cutting edge of the tool is brought against the gaging surface before being tightened. This enables the machine operator to set the tools always in the same position with respect to the zero readings on the micrometer dials of the feedscrews, thereby making it possible to use the micrometer dials instead of calipers or large micrometers to ascertain when the castings have been turned to size.

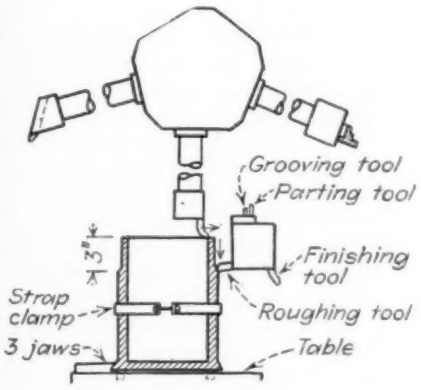
The original setting of the tool in the side head is made as follows: A bushing is placed in the machine and turned to some specified diameter such as 8 in., after which the tool is placed in the side head and clamped against the work with the micrometer dial on the feedscrew set at zero. The 8-in. bushing is then removed, and the tool gage clamped to the toolholder. The lip of the gage is brought to the cutting edge of the tool by vernier adjustment, and the vernier reading is noted. Whenever a new or reground tool is applied, the tool gage is first mounted in the toolholder, the lip is adjusted to the noted vernier reading, the cutting edge of the tool is placed against the lip of the gage, and the tool is tightened. With a new tool thus set in precise relation to the zero reading on the feedscrew dial, finish sizes on the casting above and below 8 in. are then made directly by the feedscrew dial readings.

After turning and boring operations are completed, the top of the casting is recessed and faced with a combination tool in one of the holders on the main turret head. While this operation is

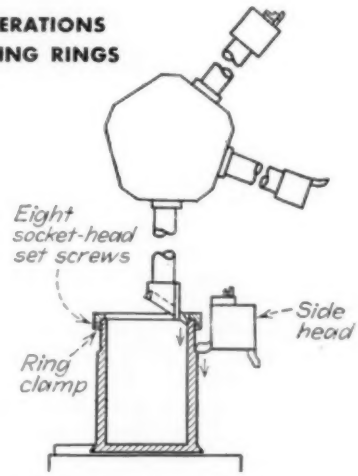
The valve packing rings are machined complete on Bullard vertical turret lathes. Tooling is set up for simultaneous rough boring and turning, and finish facing, turning and parting the rings from cast gun-iron drums



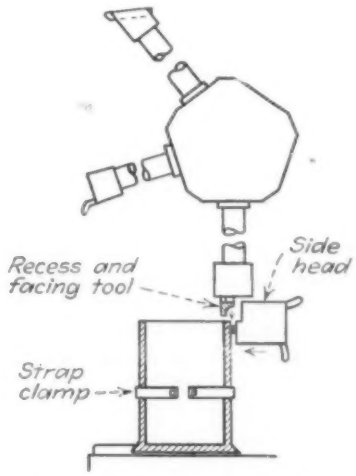
MACHINING OPERATIONS ON VALVE PACKING RINGS



Slit the drum, apply strap clamp, face the top, and rough and finish turn a 3-in. length at the top of the drum



Remove strap clamp, apply ring clamp, bore complete, and finish turn the lower portion of the drum



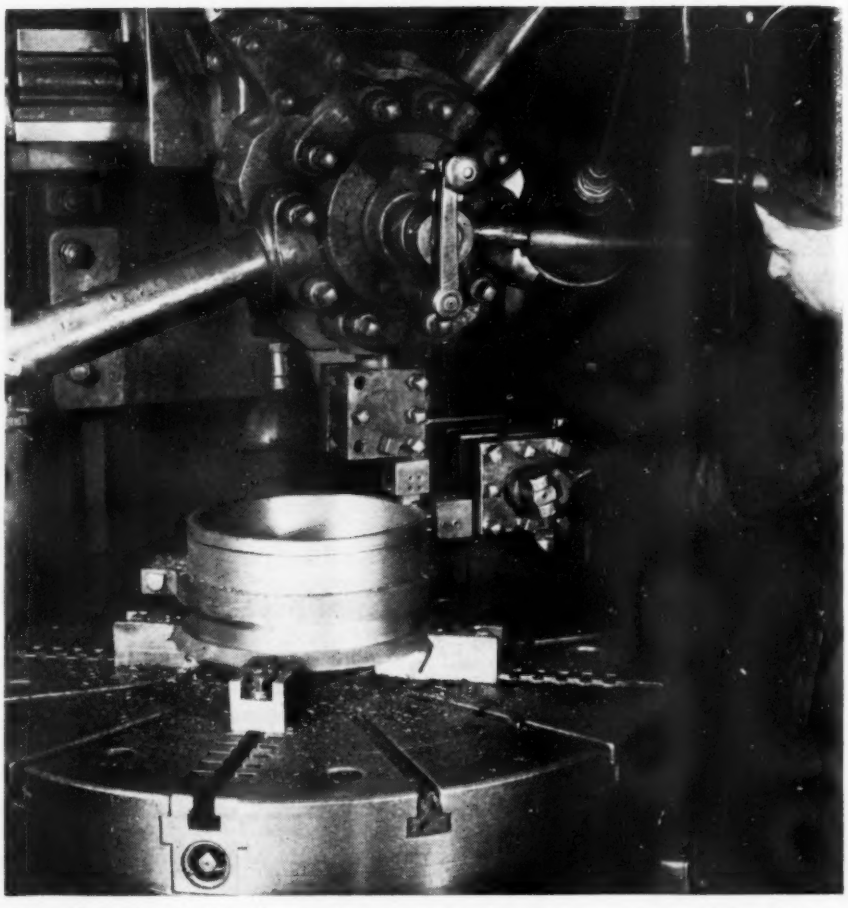
Apply strap clamp, remove ring clamp, and recess and finish face the top of the drum. Part one ring and groove for the second ring

being performed, two tools in the side head are fed horizontally into the casting. The top tool, set $\frac{3}{8}$ in. ahead of the bottom tool, parts the rings from the casting, while the bottom tool grooves the casting preparatory to parting the next ring. These operations are done at a surface speed of 64 ft. per min., and a feed of 0.011 in. per revolution.

Parted rings are stenciled with serial numbers of 1, 2, 3, 4 or 5 to indicate their size and to eliminate excessive stenciling. No. 1 indicates a ring of nominal diameter, No. 2 a ring $\frac{3}{32}$ in. oversize, while Nos. 3, 4 and 5 indicate oversizes of $\frac{3}{16}$, $\frac{9}{32}$ and $\frac{3}{8}$ in., respectively. All rings are ground on the flat side to specified width.

Slotting the casting before machining provides a snap action that gives each ring an opening of approximately $\frac{3}{8}$ in. after parting. This produces a tension in the ring which requires a pressure of about 60 lb. applied at points 90 deg. each side of the slot in order to close the ring when the piston valve and ring assembly is inserted in the steam-chest bushing on the locomotive.

Production with the set-up described is 80 packing rings every eight hours on one machine. Usually two machines are engaged continuously on the job, utilizing their maximum capacity. Since the shop furnishes rings for all repair shops on the railroad, machine time at each individual shop for this work has been eliminated.



A combination tool in the main turret is used to face, recess and finish bore the top of each ring before parting it from the casting. Two tools are used in the side head, one for parting the top ring, and one for grooving the next ring to within $\frac{1}{8}$ in. of the inside diameter

GAGES GIVE US MASS QUALITY

BY LOUIS POLK, PRESIDENT, THE SHEFFIELD CORPORATION

EVERYONE familiar with the mechanical world recognizes the contribution of the machine tool to mass production of many of man's material needs. Less well known, but sharing the credit for making mass production a practical and acceptable reality, are precision gages. For, whereas machine tools are the only machines that can recreate themselves, gages are the means whereby the quality performance of machine tools is predetermined while being built, and their output checked for accuracy when in operation.

Before precision gaging equipment was available, the assembly of mechanical parts was a tedious and costly procedure. Each part had to be fitted by hand and it required a high degree of skill to do the job. If machine tools gave us mass production, then gages insure us mass quality—the factor that keeps mass production from being worthless.

Under well-organized inspection control with a sound gaging policy, parts do not come to the assembly line until they are ready for assembly. They fit the first time. They should nor ordinarily require filing or special fitting. As a result, operators of only ordinary skill are needed on the assembly line or in the assembly department. Assemblies are made quickly at a minimum cost in both time and labor. The savings thus accomplished have been proved more than compensating for the cost of the inspection.

Spot inspections, sampling inspections, rather than 100 percent inspection obviously should always receive proper consideration. But modern gages and gaging methods have so reduced in expense the mass inspection of parts, that there can be no reasonable justification on the basis of cost, and certainly none on the basis of field performance, for the use of anything but 100 percent inspection on all critical dimensions.

In addition to these manufacturing advantages, the final product is a precision-made job that will serve longer in operation and serve more effectively because all clearances are in accordance with tested ideas. Every assembly is just like every other assembly. They are uniform and every element is interchangeable with the corresponding element of another assembly. Whenever it is necessary to replace a part it can be done with the full confidence that the new part or parts will fit as well as those which have broken or worn out. This uniformity is the very keystone of mass production.

Engineering Courses Train Women

Eastern Aircraft Division of General Motors is solving the problem of filling vacancies in its engineering departments by sending women college graduates back for additional training

Two of the women college graduates taking the 90-day engineering course at Rutgers University, to prepare them for jobs as junior engineers and draftsmen with the Eastern Aircraft Division of General Motors, discuss their studies. Trainees receive $130 pay a month during the course

FACED WITH THE OBVIOUS, but none-the-less-complicating fact that the armed services need—and take—talented engineers and draftsmen, while rapidly expanding plane production calls for more and more such employees, the Eastern Aircraft Division of General Motors set out to train competent women college graduates to fill vacancies.

Last October the personnel heads of Eastern Aircraft's five plants met together to decide how best to meet the problem of securing sufficient engineers and draftsmen. A plan to recruit competent women and to give them extensive and intensive training to fit them for the positions open, was conceived and put in operation as the result of this conference. A study program was arranged in conjunction with Rutgers University, the Science and Management War Training Program and the U. S. Office of Education.

The original students started their studies on October 26, with 20 pupils, finished their course January 16 and went to work in Eastern Aircraft factories January 18. During their twelve-weeks course they studied engineering drawings, mathematics as far advanced as trigonometry, mechanics and metallurgy. Thirty of their 48 weekly class hours were devoted to instructions in mechanical drawing.

When finished, the women of this group were qualified for drafting or detailing. They went into a variety of employment: Artist; draftswomen; processing; tool designing; time study, as well as being placed in the various engineering drafting departments.

Successive groups have since been started at intervals of approximately two weeks. Odd number groups specialized in drawing, similar to the first group. Even number groups study specifications, with emphasis on mathematics, to qualify for employment in specifications departments. They have but twelve weekly hours of drawing study, and this merely in order that they may understand blueprints.

Midway in each group's twelve weeks course, members spend two periods, of three or four hours each, in tours of the plants in which they will later work. This improves their understanding of the instructions they receive.

During the courses, various plant executives lecture before the students on aerodynamic theory, parts and functions, and nomenclature. Training movies are shown to further their understanding of their studies.

To inaugurate the courses, the New Jersey College for Women, Rutgers University, sent a letter to all graduates, telling of the opportunity offered. The first training group consisted entirely of N.J.C.W. graduates.

To further spread the news, Eastern Aircraft Division sent letters to women's colleges in the northeastern United States, and placed advertisements in New York papers. Various E. A. plants transferred qualified women inspectors and expeditors to the course. Choice of candidates is now carried on by the company's New York personnel office.

In selecting students, efforts have been made to choose only college graduates. There have been exceptions to this procedure, based on a candidate's training and experience, but generally a girl must have had at least a year of college mathematics or science to be able to absorb the course.

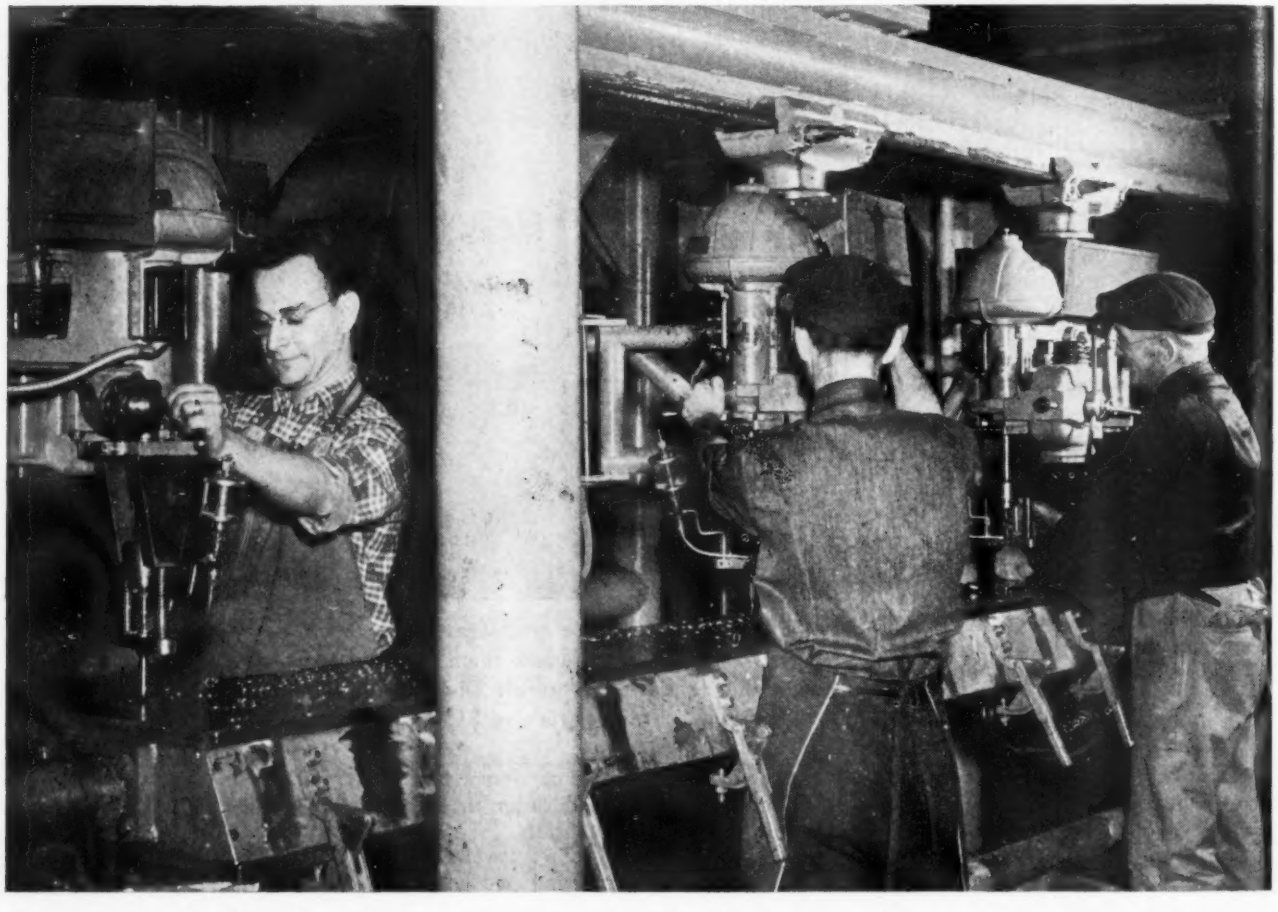
The U. S. Office of Education pays the tuition, while Eastern Aircraft pays each student a $130 monthly salary, plus time-and-a-half for overtime. Cost of subsistence and books must be met by the student.

Upon employment, the graduate student's base pay is raised to $140 per month, plus time-and-a-half for overtime. Overtime adds about $45 monthly.

Most of the trainees are about 25 years old, though ages vary up to 40 years. Quite a few are married, and some have children. While the courses are heavy, with 48 weekly class hours, only one student has dropped out of the program since it started.

Tunnel-Type Drilling Equipment

By DON C. STEWART, Assistant Mechanic, Linden Plant, Eastern Aircraft Division, General Motors Corp.
In Collaboration with WILLIAM F. OCENASEK, Chief Engineer, The Walker-Turner Company



Concentration of drillheads and workers at one fixture avoids the time lost where one operator must traverse a single spindle to widely separated hole locations and change drills

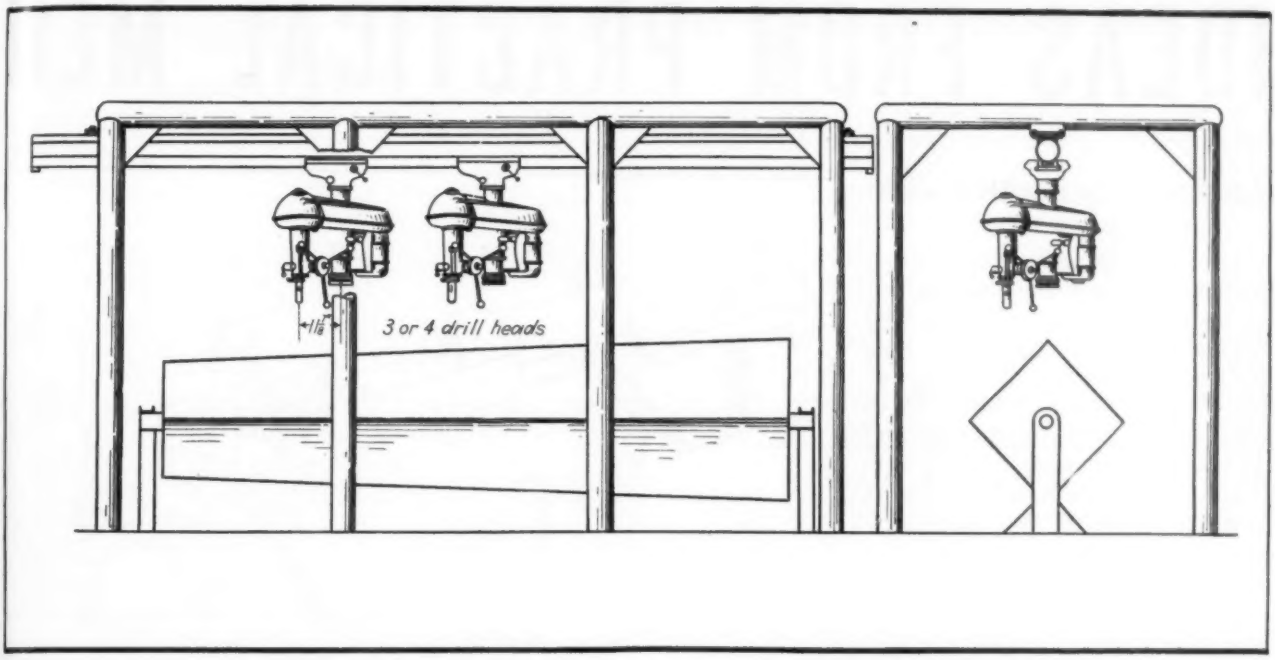
A four-fold gain in production rewarded the originators of a method for mounting several radial drillheads over one or more drilling fixtures for large aircraft subassemblies like stub beams

FOR LINE DRILLING bulky subassemblies like stub beams and wing spars with minimum handling, the Linden Plant, Eastern Aircraft Division, General Motors, has installed a number of tunnel-type drilling machines that consist of a box-like tubular steel framework, one or more overhead rails and a number of rail-supported radial drill heads. One or more fixtures are placed under the rails.

This equipment enables several operators to work simultaneously at one jig, each being responsible for drilling over a limited portion of the work area. By concentration of labor in this manner, production is at least four times greater than with the previous method. In the latter case, one operator moved a crossrail and drill head over the entire work area, and was responsible too for subassembly and work-handling operations.

The tunnel-type drilling machine is readily adaptable to various jobs and production methods. The framework and rail can be built in any desired length. It is possible, for example, to mount 24 radial drill heads on one rail for station-type drilling, although two to eight heads are usually sufficient for most components. If the rail is placed centrally in the framework, operators can work on both sides of the fixture, some for drilling and others for subassembly. Or the rail may be placed along one side of the frame.

When right- and left-hand components are produced, two rails can be provided near the outer edges of the framework. In this case, the operators work back to back in the center of the tunnel-type structure. Higher produc-



Supporting rails for the drillhead can be played centrally, or along one or both sides of the tunnel-type drilling machine, as required by the fixtures in use. As many as 24 heads on one rail are contemplated for station-to-station drilling and subassembly operations on one aircraft component

tion is realized in the tunnel-type drilling machines when some jobs are partially subassembled on benches at a prior stage in the line.

The tunnel-type drilling machine was jointly conceived by the Linden Plant and the Walker-Turner Company. The latter developed the radial drill head, using a combination of parts from its standard 20-in. drill press and its radial drill. The rail mounting is of the anti-friction type, consisting of eight ball bearings, four on top of the rail and four on the bottom. Eccentric mounting of certain bearings permits the drill spindle to be aligned vertically. The drill head covers a 23-in. circle, has a total vertical adjustment of 16 in. (6-in. quill travel and 10-in. head adjustment).

To cope with the various drilling and reaming problems encountered in aircraft work, the Linden Plant uses these drill heads having selective spindle speeds from 85 to 5000 r.p.m. The extremely low speed of 85 r.p.m. is secured by means of a five-step pulley and gear motor drive and is required when drilling and reaming at assembly of the molybdenum-steel hinge bracket to the web of the duralumin wing spar.

To enable the operator to drill and ream the hinge-bracket assembly without changing speeds, an additional Walker-Turner standard 1100 Series drill head is used for reaming between two fixtures. The low-speed drill head provides a satisfactory spindle speed for the reaming operation. Moreover, quantities involved do not warrant the purchase of automatic equipment and the time necessary to design and build such equipment was too great and would have caused a delay in the production program.

The forged moly-steel hinges are drilled slightly undersize in the machine shop. At the drilling machine, they are slipped onto the web of the dural wing spar. The holes in the web are drilled with a conventional twist drill, using the forging as a templet. Reaming is done with a four-flute carbide tool having a 7-deg. hook, 0.010 in. clearance and about 0.006 in. taper.

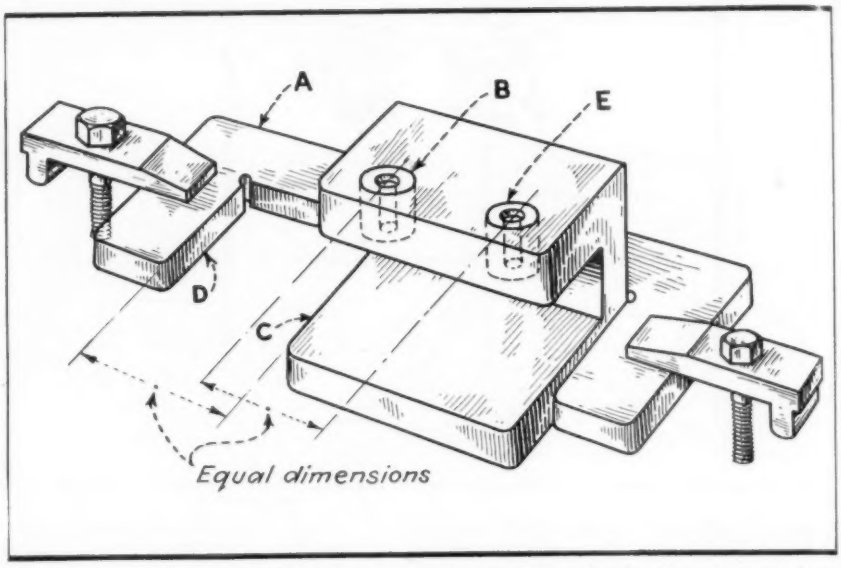
Each operator is quickly trained to handle the work at one station of a line-drilling sequence and to perform additional subassembly operations if required

IDEAS FROM PRACTICAL MEN

Locator Plate Positions Jigs

BY ALEX GEORGE

Drill-press operators using drill jigs have to move them from one position to another on the table for the drill to enter the jig bushings. When a jig has but two holes or drill bushings we build a locator plate *A* for it, which positions the jig quickly and eliminates searching for the bushings. After drilling the hole under bushing *B*, the jig is moved to the left until edge *C* contacts edge *D* of the locator plate, thus bringing bushing *E* under the drill with the least possible effort. This not only speeds production, but decreases operator fatigue, especially when hundreds of similar parts have to be drilled daily. Locator plates of this design have become standard parts in our shop for two-hole drill jigs.



A minimum of time and effort is required to position the bushings in two-hole jigs beneath drills when using a jig locator plate

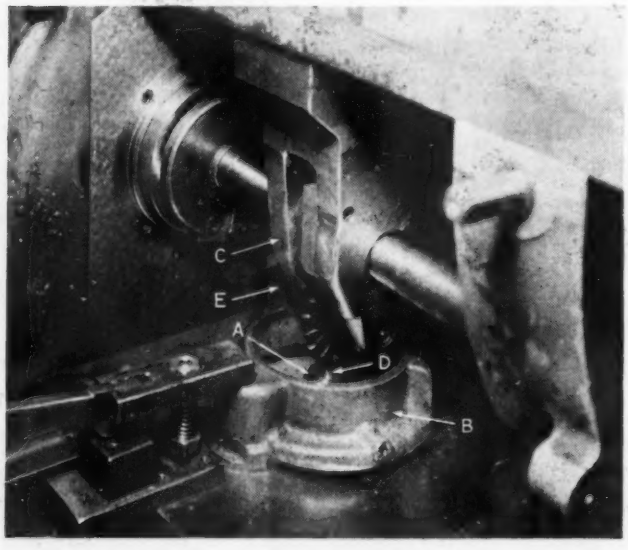
Cutter Adapter Speeds Slot Milling

BY R. SANTORO, GENERAL ELECTRIC COMPANY

When slot *A* had to be machined in the inclosed area of bronze casting *B* on a production basis, cutter adapter *C* was devised. It reduced machining time on each casting from 31½ min. to 2½ min.

Slot *A* is 0.1875 in. wide, 1⅜ in. deep, and 1¼ in. long, and is machined through the center of boss *D* in which a ¾-in. hole is bored. The top of the boss is centrally located 1⅜ in. below the rim of a 4.56-in. bore in the casting. Obviously, an ordinary cutter small enough in diameter to enter the casting would not go down far enough to cut the slot, while a cutter large enough to cut the slot would also dig into the casting. Adapter *C* permits a small cutter to be arranged beneath the arbor to do the job satisfactorily. Work is fed straight up to the cutter, and a small cross-feed is used to flatten out the bottom of the slot.

The adapter has a machined head to fit the dovetail on the arbor-support arm. A cam-action locking bolt built into the head secures the adapter to the dovetail. The cutter is rotated by a gear on the arbor and a pinion on the cutter shaft. A guard protects the gears from chips. The work is raised to the cutter by automatic table feed, which kicks out just short of the required depth. The work is fed the rest of the distance manually. Stop *E* with setscrew adjustment locates against the arbor, assuring accurate slot depth. The casting is set up quickly over locator pins fitted in a plate bolted to the table. Cam-lock clamps hold the work for milling.



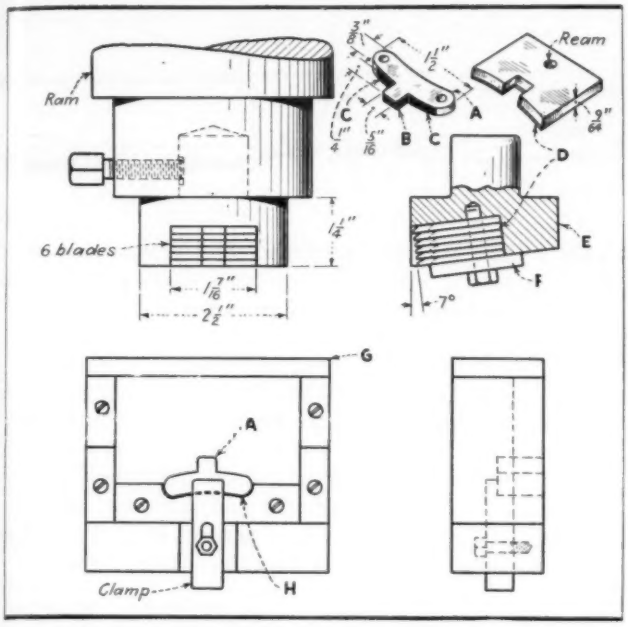
A small cutter driven by a gear and pinion from the milling machine arbor permits the slotting of a boss deep in the casting

Punch Press Used As a Broach

BY ROBERT MAWSON

After brass die stamping *A* had been formed in a press, tongue *B* and adjacent convex surfaces *C* had to be machined. Since the work was being done in a shop engaged primarily in the production of stampings, a milling machine was not available to finish the surfaces with a form cutter. Therefore, a series of cutters were mounted in a press ram, simulating a broach, to do the job.

Cutting blades *D*, made of tool steel, were machined to the required contour, hardened and ground. Holder *E* was



Six blades, simulating a broach, were mounted in a punch press to machine the contour on brass stampings

machined with a recess for six blades, the recess being 7 deg. to the vertical. The blades were set snugly in the recess to prevent slipping when held by the bolt and clamp *F*. The recess and blades were so machined that the first four blades each removed from 0.003 to 0.005 in. of metal from the stamping, while the last two blades acted only as sizing tools.

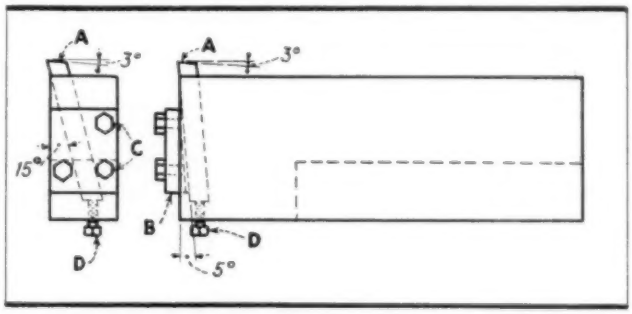
Fixture *G* with machined recess *H*, the contour of which was the same as the back of the stamping, was used to locate the part. After clamping, one stroke of the press produced a part. When the edges of the cutting blades became worn, it was only necessary to insert a new top blade to maintain the accuracy of the finished surfaces. After machining, the two holes were drilled and reamed in the part, using a jig wherein the part was located by the contour surfaces.

Work Machined With Vertical Toolbits

BY OSCAR CRAFT

Tests made with the illustrated toolholder, designed to hold the toolbit *A* vertically to the work, have shown a reduction in tool breakage, higher permissible cutting speeds, and fine finishes at increased speeds. When sharpening the toolbits it is only necessary to grind the top of the bit. A nose radius of $\frac{1}{32}$ in., should be maintained.

The toolbits should be ground to fit the milled slot in the holder. Clamp *B* is machined with a tapered shoulder to bear against the toolbit. Three screws *C* provide the necessary clamping pressure. Setscrew *D* takes the thrust of the cut. When making the holder, the slot for the toolbit can



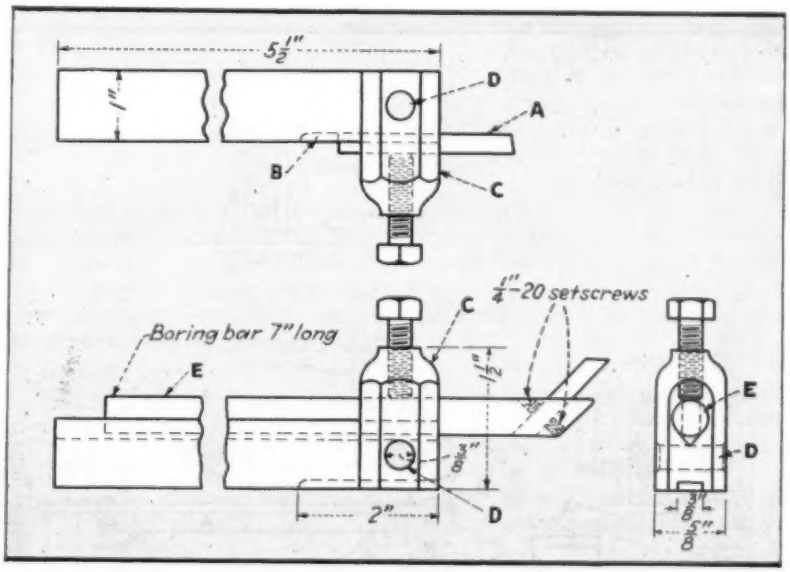
Toolbits can be held vertically to the work to give longer tool life, higher cutting speeds, and fine finishes at increased speeds

be milled completely across the end, after which the bottom of the slot can be welded and a hole drilled and tapped for setscrew *D*. The rake and clearance angles shown in the illustration can of course be changed to suit different working conditions. The toolholder should be heavy enough to take the full length of toolbit *A* when it is first purchased, even if the holder has to be cut away as shown by the dashed lines.

Boring Small and Large Holes

BY P. SAINT-ERNE

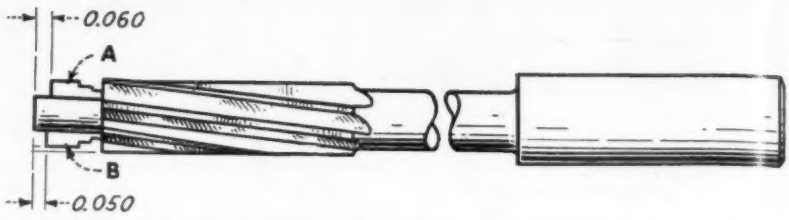
Our shop, engaged in the maintenance of aircraft and aircraft engines, frequently must rebore small and medium diameter holes for the application of oversize bushings. The speed with which this work can be done is facilitated by the illustrated combination boring bar and holder. For boring small diameters to a depth of 2 in., a $\frac{3}{8}$-in. tool bit *A* is held in a slot *B* by swivel head *C*. For larger diameters, head *C* is swiveled about pin *D* to clamp boring bar *E* in the V-groove. The assembly is then mounted in the lathe toolpost. The holder is made of cold-rolled steel, while the boring bar is made of hardened tool steel. Pivot pin *D* is peened at both ends so that head *C* can be turned 180 deg. for holding either the toolbit or the boring bar. The head of this holder does not interfere with the work when boring up to a shoulder.



A toolbit and boring bar can be mounted in this holder for boring small and large holes, respectively

Combined Boring Tool and Reamer

BY A. M. SCHATZLE
GENERAL ELECTRIC COMPANY



The leading blades of this combination boring tool and reamer take roughing and finishing cuts in a hole that must be reamed smooth to close tolerance and without scratches

The illustrated combination boring tool and reamer is used to produce straight smooth holes when handled by relatively unskilled workers. It was designed to finish valve holes in sleeves 2 to 5 in. long after broaching and other methods did not produce satisfactory results. The valve holes run the full length of the sleeves, and are 0.250, 0.3125 and 0.625 in. diameter, plus 0.0002 minus 0.0000 in. The holes must be round and free from taper, and must have a polished finish with no scratches allowed. The sleeves have as many as 18 cross holes through the valve body. The problem was to produce a straight hole through which a solid bar gage would pass without the slightest bind—the diameter of the gage is 0.0002 in. under the minimum hole size.

The combination boring tool and reamer was made from a standard six-flute machine reamer. Four flutes were cut back $\frac{3}{8}$ in. from the end of the reamer, leaving two opposite flutes *A* and *B* to act as cutting tools. Blade *A* was then cut back 0.060 in. from the end of the reamer, while blade *B* was cut back 0.050 in. The edges of blades *A* and *B* were ground down so that they extended 0.002 and 0.006 in., respectively, less than the radius of the reamer. Proper clearance angles were ground on the cutters and reamer flutes. The reamer was also ground so that the nose was 0.0003 in. larger than the back.

The result was a tool that bores its own hole for reaming. Cutter *B*, being in the lead and of smaller diameter than blade *A*, takes the roughing cut. Blade *A* takes a semi-finishing cut, leaving 0.004 in. for reaming. The cutters bore a uniform hole for the reamer, while the reamer in turn serves as a bearing for the cutters, holding them firm, free from chatter, and on a straight course.

Preparatory to using the tool, the sleeve is drilled leaving the hole 0.020 in. undersize. The outside diameter of the sleeve is then ground true with the drilled hole, and it is mounted in a fixture on a jig borer where the hole is bored to a depth of $\frac{1}{2}$ in., holding the diameter 0.001 to 0.0015 in. smaller than the diameter of the reamer. This gives the body of the reamer a start before the tool starts cutting. The finishing of the valve holes once required high skill. They are now reamed satisfactorily by a semi-skilled worker.

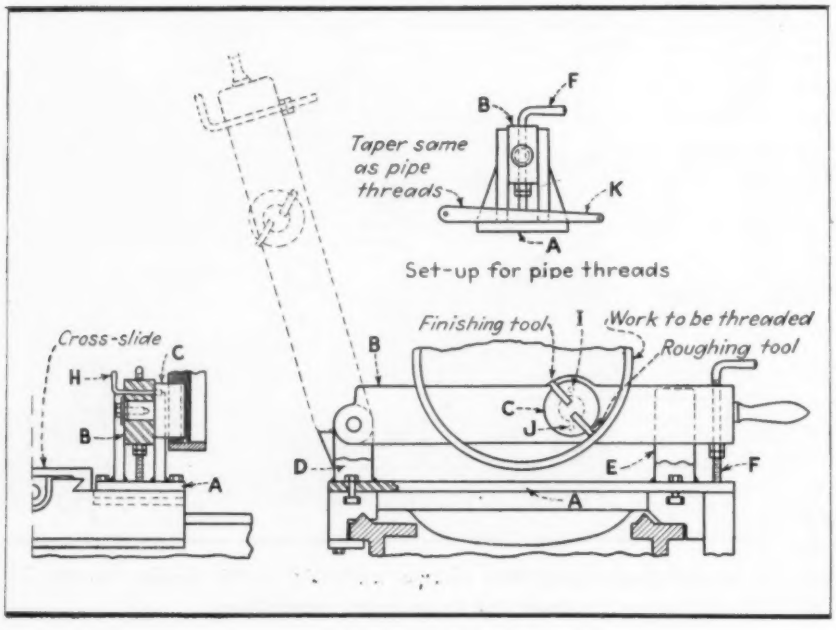
Chaser Tool Speeds Duplicate Threading

BY S. H. EASTERDAY

We had several hundred parts of large diameter to bore and thread internally on an engine lathe. The threading attachment shown in the drawing was built to permit quick and accurate setting of the tools for each successive part, thereby reducing production time.

Base *A* of the attachment is bolted to the lathe carriage ahead of the cross-slide. Crossbar *B*, which carries the toolhead *C*, is pinned between two brackets *D* welded to the rear of base *A*, and can be thrown back out of the way when boring the hole in the workpiece. When ready for threading, crossbar *B* is brought down between brackets *E* wherein it is a tight sliding fit. The position of the cutting tool is set by adjusting screw *F*. Double nut *G* is jammed under the crossbar to maintain the set adjustment for duplicate threading when production is underway. Toolhead *C* can be indexed to two positions for using the roughing and finishing tools as needed—index pin *H* locates in holes *I* and *J* for setting the roughing and finishing tools, respectively.

The attachment was also used for taper cutting of pipe threads, since the lathe was not equipped with a taper turning attachment. To accomplish this, wedge *K* is bolted to the lathe bed directly under adjusting screw *F*. Since the wedge is stationary, the adjusting screw will slide along the side of the wedge as the carriage moves, thus cutting the threads to the desired taper.



This attachment makes possible the quick and accurate setting of cutting tools when chasing straight or tapered threads on duplicate parts

Engineering Design
—Creator of America's Mechanized Might

In war, as well as in peace, the design engineer is the vital link between the inventive mind and the mass-production reality

It is gratifying and interesting to note that reports of new "secret weapons" not only have reversed their course during the past few months . . . they also have increased in frequency. Once they filled us with dread and misgiving. Today the enemy does the worrying.

Word about the latest new Army weapon reached us as this was being written . . . a 2½ ton truck that performs on water as well as on land with equal efficiency. "The Duck", resembling an overgrown amphibious jeep, is particularly suited to landing operations where docks are lacking. Loaded with 20 fully equipped soldiers or their equivalent in supplies, its propeller runs it ashore. It climbs the beach on its six-wheel drive and continues the trip on land.

This important addition to our "second-front" fighting equipment, coming so closely on the heels of the now famous tank-killing "Bazooka", is one of many history making contributions of American design engineers — the men who transform nebulous ideas into practical realities — the men who make our war machines superior to those of our enemies.

Invasion and eventual victory became a certainty as soon as America's design engineers threw their full effort into the war against aggression. Adapting intricate ordnance designs to mass production, these men developed weapons such as the M-10 destroyer of Rommel's tanks and brought out the new fighting planes and bombers that have won the air superiority that has turned the tide against the Axis. Taking ideas and giving them form, selecting the materials of construction, deciding upon the method of fabrication, adapting the electrical and mechanical parts that power the product, specifying the finish that protects and beautifies it . . . these men are the focal point of American production. Their ingenuity has no parallel. Once they put automobiles on a mass production basis and within the reach of all. Today, after less than three years and with little previous experience in armament design, they have brought America's war weapons to the highest efficiency . . . surpassing Hitler's weapons despite all the vaunted scientific wizardry of the Germans and their ten year start.

At this point it is well to remember that while Germany's military might is traceable to its superiority in armament, many of the basic technological discoveries (including the airplane and the submarine) are the products of American genius. The Germans always have been aware of the military advantages of technological superiority and have forced its expansion with all their might. They knew that mobility and surprise play a decisive role in modern warfare and their design engineers were kept busy, with unique intensity, to achieve unprecedented results in fast-moving, hard-hitting fighting equipment. Our own military and industrial engineers did not go into action until it became certain that we would be involved in the conflict. But even before our country actually embarked on its Preparedness Program they were busily engaged in developing the designs of our war equipment. Tanks, planes, guns, ships and hundreds of other apparatus and machines of war were studied. Carefully selected committees of our national engineering societies were organized under the leadership of the Army Ordnance Department to serve as advisors and consultants in the development of advanced designs of tanks and other motorized equipment of war. The above mentioned "Duck" and the now famous Sherman tank are just two of the many results of these efforts.

After the Preparedness Program had officially been launched and Congress had made its initial appropriation, it was necessary to create the manufacturing blueprints from which the engines of war could be built. Because the designs of the machines of production, as well as the designs of the products themselves, determine the speed and economy with which anything can be manufactured,

This is the thirteenth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

the capacity of our industrial system is dependent, to a considerable extent, upon the ability and ingenuity of American design engineers. Germany's military might was successfully mechanized because Germany, for more than 10 years preceding the war, was riding the wave of a world-wide technological revolution. This revolution was as far-reaching as the advent of the electric motor and the internal combustion engine. It was born of the profusion of inventions and discoveries since the last war. German design engineers took advantage of every one of these.

If we are to defeat our enemies and if we are to continue to play the leading role in the post-war world we must make better use of the new technology than do our enemies. The job is up to American product engineers who already have made tremendous strides in designing the intricate machinery of production and of war equipment. Much remains to be done however.

It has been said that the Germans have not developed one single item that can be classified as basically original, nor are there indications that any so-called "secret weapon" will henceforth be developed by them. Today the Nazis are completely outclassed by the tremendous manpower of engineering brains that is at the disposal of American industry. Although we were faced by the same fundamental problems of shortages in materials, manpower and time, our engineers not only solved these problems quickly and effectively, but they outstripped the enemy by the preponderant weight of talent which we were able to bring to bear upon our problems. As is evidenced by studies of the designs of captured German war equipment, our airplanes are faster, carry heavier loads, have superior protective armor and heavier armament. Our tanks, especially the Shermans, stand unmatched. Our tractor-mounted artillery excels theirs in fighting power. Our automotive vehicles are the envy of the world. Our battleships are supreme. Our signal and detection devices are frustrating all of our enemies' attempts to dominate the seas.

And as we approach the end of the conflict, the pattern of which already has been set, the forces that converted American industry from peace to war-production will again be brought into play, and the product engineer will continue to be the fulcrum. Our post-war industry will grow from his blueprint. Nor will his job be any less urgent, any less responsible, any less sweeping in its effects than were his efforts during the war-preparedness program.

Since the cessation of the manufacture of peace-time goods, many new materials and production techniques have been developed. Plastics, synthetic rubber and magnesium in the field of materials were relatively new and restricted in their uses when war came. So were powder metallurgy, induction heating, electrostatic heating, adhesives for joining metals and compressed resin-impregnated wood. The new possibilities in product design created by the electronic devices and applications developed during the war period virtually stun the imagination and the "atomic revolution" promises to change the entire pattern of manufacturing operations.

Never before has there been so much speculation about the future as there is today. Looking forward, who can doubt our limitless capacity to continue our industrial world leadership?

While no one can predict developments in product design in the post-war period, certain it is that they will be so vastly different and so far superior to existing designs that they will obsolete most products as we know them today. With engines of vastly superior metals, designed to burn 100 octane gasoline and built to a precision ten times greater than that of pre-war engines, our post-war automobiles will give from 40 to 60 miles to the gallon. Tires will last from forty to fifty thousand miles. The comfort and smoothness with which these cars of tomorrow will glide along are undreamed of today. Polaroid windshields will eliminate the glare of oncoming headlights and the driver will need to give but scant attention to the manipulation of his simplified gear shifts.

According to no less an authority than Igor Sikorsky, we stand on the threshold of a new air age in which the helicopter will contribute to the greatest prosperity we have ever known.

Prophecies are hard to make at a time like this but speedy house building seems to be a certainty in the world of tomorrow. Air conditioning, new methods of heating, humidifying and drying, promise to be necessities in the post-war home. Vacuum sweepers will be much lighter, less noisy and easier to manipulate. Washing-machines will be fully automatic and practically free of noise and vibration. Not only will our homes and most of the furnishings be of radically new design, but so will the factories and machines that produce them.

Only one factor can prevent the fulfillment of the dream of the product designer. His job is not accomplished over night. To convert sound ideas into production blueprints involves a great deal of time and money. The building of test models is an expensive and tedious procedure. An abundance of seed money is required to perfect the product, to develop mass-production methods and to bring it to fruition as a finished saleable product.

It is the patriotic duty of every industrial leader to hasten these developments so that the material benefits created by them may speed our progress along the road of abundance.

President, McGraw-Hill Publishing Company, Inc.

Armament

SECTION OF AMERICAN MACHINIST

Automatic Sorters for Aircraft Rivets

Rivets recovered from sweepings are put through this diameter-sorting machine. In order to conserve steel, only the drive mechanism, the feed hopper, the oscillating sorting chute and some of the fittings on this machine are made of metal. The stand and most of the framework are wood

By HAROLD O. MILLS AND LUDWIG DONNER
Nashville Division, Consolidated Vultee Aircraft Corporation

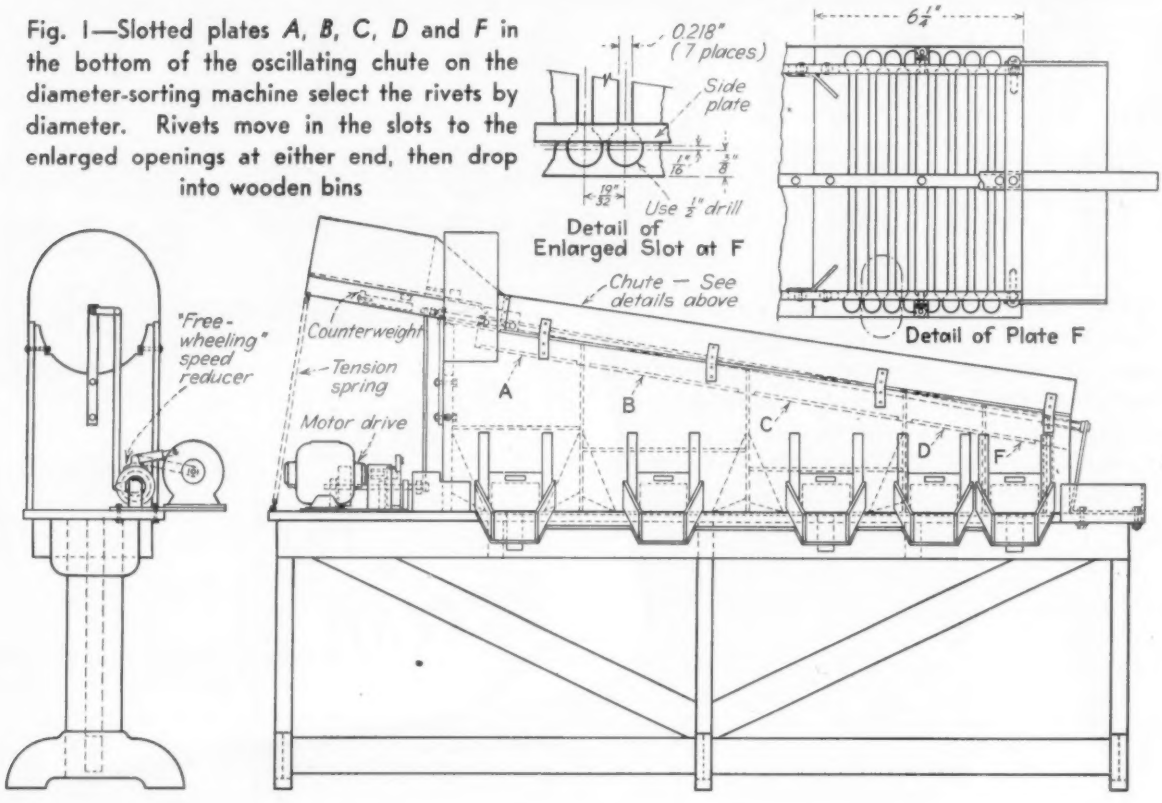


Fig. 1—Slotted plates *A*, *B*, *C*, *D* and *F* in the bottom of the oscillating chute on the diameter-sorting machine select the rivets by diameter. Rivets move in the slots to the enlarged openings at either end, then drop into wooden bins

SUCH LARGE QUANTITIES of rivets are handled each day in connection with the mass production of all-metal warplanes like the Vultee Vengeance dive bomber that considerable numbers are unavoidably dropped on the floor. Every effort is made to separate rivets from floor sweepings because critical aluminum alloys are involved, and the investment represented is considerable.

Hand sorting rivets recovered from sweepings is justified only on the basis of salvaging strategic materials; the cost of the hand-sorted rivet is higher than for a new one. To put the matter on an economic basis, Vultee tool and production engineers have developed two automatic rivet-sorting machines. One machine sorts rivets according to shank diameters, will handle more than 100 lb. of material in an 8-hour day. The second machine resorts the rivets for head type and length at a rate ten times faster than by hand.

The machine for sorting rivets by shank diameter has five stations for recovering $\frac{1}{16}$ in., $\frac{3}{32}$ in., $\frac{1}{8}$ in., $\frac{5}{32}$ in. and $\frac{3}{16}$ in. rivets, respectively, as they slide down an inclined chute. Rivets sorted at the various stations drop into bins equipped with trap doors. Paper bags are filled from the bins, and the rivets transferred to the length-sorting machine. Rivets of shank diameter larger than $\frac{3}{16}$ in. drop off the end of the chute and into a box for hand sorting.

Construction details of the shank-diameter sorting machine are as follows: The main section of the chute is 60 in. long, 6½ in. wide and 3 in. deep, and is inclined at an angle of 10 deg. The chute is suspended from a ½-in. shaft held in bearings, and is oscillated through a 90-deg. arc twelve times per minute by a motor and free-wheeling reducer drive.

Rivets are fed onto the sorting chute by a feed hopper in an even stream sufficient to sort thousands of rivets daily and yet slow enough to eliminate crowding. Oscillation of the chute causes the rivets to travel slowly down the chute and drop through slots at the respective sorting stations. A counterweighted sweep arm in the bottom of the feed hopper swings back and forth each time the chute oscillates to prevent a rivet jam at the hopper feed opening.

The five diameter-sorting stations consist of slotted plates fastened in the bottom of the chute at *A*, *B*, *C*, *D* and *F* in Fig. 1. Each of these plates has a series of slots placed crosswise to the stream of rivets being sorted. Slot width at the first station permits the shank of $\frac{1}{16}$-in. rivets to fall through, the rivets then being suspended by their heads. Rivets of increasingly larger shank diameter are sorted out at the succeeding stations, which have slots of greater width.

Oscillation of the chute causes the rivets suspended in a slot to move away from the centerline of the

Rivet Size	A	B	C	D	E
3/32	7.875"	3.859"	0.062"	1/8	0.170"
5/32	8.000"	3.890"	0.093"	3/16	0.278"
3/16	8.062"	3.906"	0.125"	7/32	0.344"

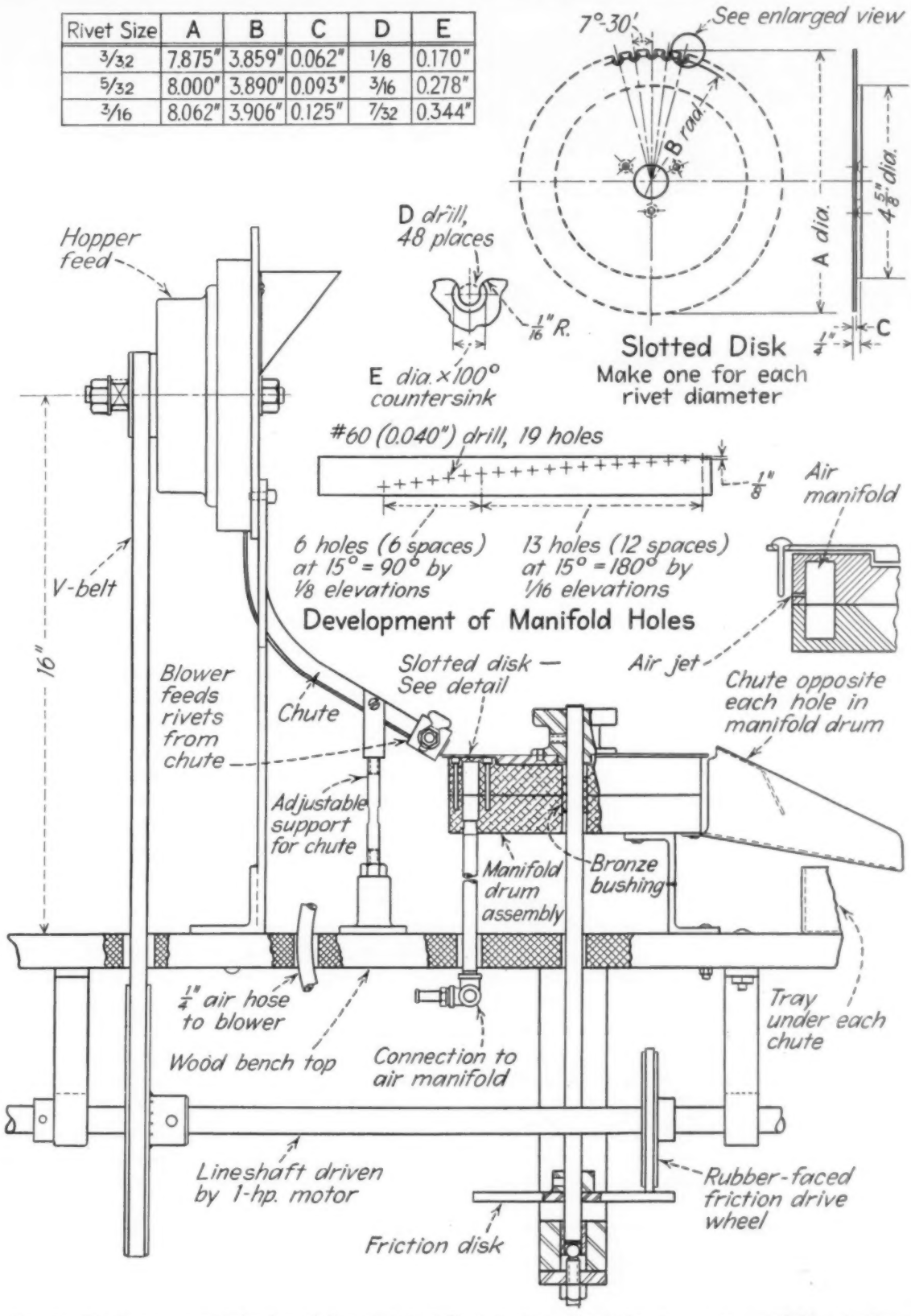


Fig. 2—Rivets are sorted for length by air jets drilled at stepped heights in an air manifold. A given rivet stays with the rotating notched disk until its shank is struck by an air jet, is then blown into a tray reserved for that particular length of rivet

Four length-sorting machines mounted on a common bench handle the four sizes of rivets most commonly used. Each machine handles a specific shank diameter as previously sorted, and selects rivets first for head type, then for length

sorting plate, and toward the enlarged openings found at either end of the slot. In the case of slots for $\frac{1}{16}$ in. rivets, the enlarged openings are $\frac{3}{16}$ in. wide. To prevent mis-sorting and rivet jams, the side plates of the chute are positioned above the enlarged openings. However, clearance is cut on the bottom edges of the side plates at each station to permit selected rivets to pass under and reach the enlarged openings. Thereupon, the sorted rivets fall through the enlarged openings and into the plywood bin below.

The number of slots in each sorting plate depends upon approximate percentage of rivets of a given size in the mixture and the difficulty of sorting. Dimensions and number of slots at each station are given in an accompanying table.

Rivets that have been sorted for diameter are resorted for head type and length of shank by the second automatic machine. The first machine of its type constructed at the Nashville plant really consists of four distinct units mounted on a single bench. Rivets of $\frac{3}{32}$, $\frac{1}{8}$, $\frac{5}{32}$ and $\frac{3}{16}$ in. dia. are sorted respectively on the four units. Since $\frac{1}{16}$, $\frac{1}{4}$ in. and larger rivets comprise a small percentage of the total used, they are sorted for length by hand.

Each of the length-sorting units is fitted with a dial with 48 countersunk notches cut into the periphery to suit the diameter of rivet being sorted. Rivets are dumped into a hopper feed which delivers the rivets head end up to an air nozzle adjacent to the notched disk. The air blast transfers one rivet at a time to the notches in the disk, where they are supported by their heads, and their shanks hang free below the disk.

The disk is rotated at from 5 to 8 r.p.m. by a friction drive. As the rivet commences to travel with the disk, it is selected for head type by means of a sweep arm. The arm is first set low enough so that it will kick round and flat head rivets off the disk and into a box, but permit rivets with countersunk heads (which do not project above the disk surface) to be carried past the means for selecting them for length. When all of the countersunk-head rivets have been sorted from a batch, the contents of the box are dumped into the hopper. Then the sweep arm is set higher to throw out the round-head rivets and permits the flat-head rivets to pass. Finally, the round-head rivets are sorted for length.

Rivets that escape the sweep arm are sorted for length by air jets drilled at stepped heights in the outer wall of the circular air manifold just below the rotating disk. Nineteen 0.040 in. holes are drilled at 15 deg. intervals around the periphery of the manifold.

The jet layout is such that the rivet approaches the lowest hole first. The first six holes are progressively higher by $\frac{1}{8}$ in. increments, the remaining holes by $\frac{1}{16}$ in. increments. Thus, the longest rivet is selected first, since the air jet at the lowest hole strikes the rivet shank and kicks the piece into a sheet-steel chute leading to a tray for that position. The next rivet fed into the disk may travel past 17 of the 19 holes before it is blown into the proper chute. Thus, after all the countersunk-head rivets escaping the sweep arm are sorted, the trays at the various stations are filled. The pans are removed, and the contents are checked by hand for imperfect or damaged rivets. The good ones are returned to stock.

Flat-head and round-head rivets, previously sorted for head type, are then run through the machine in sequence to finish sorting the batch for length.

Dimensions of Slotted Plates for Diameter-Sorting Machine

Station	Rivet Size	Plate Length	Details of Slots				Head Clearance in Side Plates
			Number	Width	Center Distance	Opening	
A	1/16	11¼	33	0.077	19/64	3/16	0.050
B	3/32	17½	44	0.109	23/64	17/64	0.080
C	1/8	16½	33	0.140	29/64	11/32	0.100
D	5/32	8½	14	0.172	1/2	27/64	0.130
Fi	3/16	6¼	7	0.218	19/32	1/2	0.150

Cartridge Tools Made for Long Life

Inexperienced workers at the Lake City Ordnance plant are turning out tools that give record-breaking performance

TOOLS FOR SMALL ARMS and machine gun ammunition must meet some unusual requirements. They must be made with gage-like precision, many of them to limits of two ten thousandths of an inch, in order to match the high degree of accuracy specified by the Ordnance Department for bullets and cartridge cases. These products are made in a manufacturing set-up in which workpieces are fed automatically from one operation to the next. Hence machine down time is especially disruptive. In a plant where the product is counted in millions, tool life takes on a new meaning.

The Lake City Ordnance Plant, near Independence, Mo., has established an excellent record for increasing the number of bullets and cartridge cases obtained from its tools. Combined with this performance is a well planned tool steel salvage system by which only the smallest bits of steel are returned to the mill for smelting.

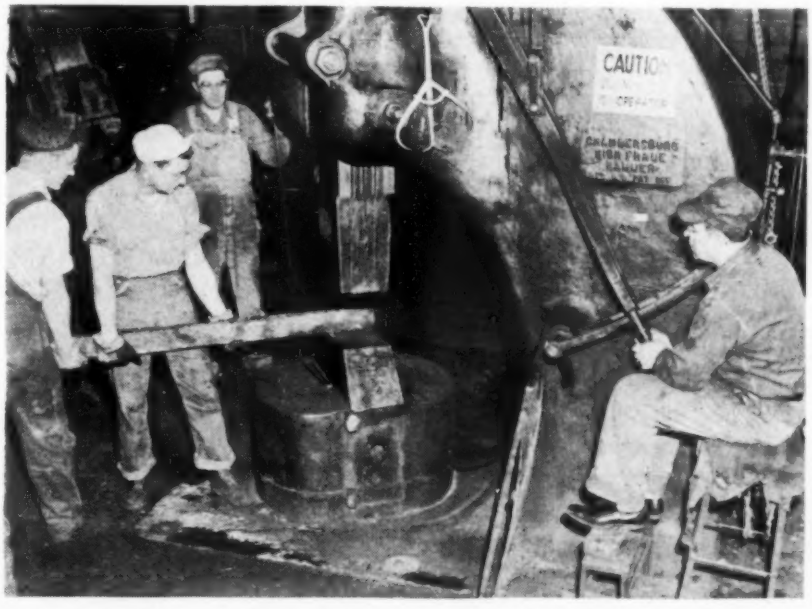
These results rest on principles which are often overlooked in the rush of wartime production. Perhaps this oversight is caused by a lack of appreciation of the difference between a tool that is good enough and one in which close attention is paid to all details of its manufacture. Certain tools at Lake City now give runs of 250,000 parts which in the past turned out only 5,000 in the same machines under the same operating conditions.

Lake City's success in prolonging tool life is based on careful selection of steels, greater resort to forging, precision heat-treatment and extremely fine finish. Certain tools, such as bullet and cartridge-case punches and sizing dies, which are subjected to severe frictional loads, are chromium plated. This process gives a hard surface and the benefit of the increased slipperiness of the chromium. Plating is also employed to salvage worn tools by building up the metal lost in service.

Forging was first tried on one or two particularly tough applications; the results were so startling that today scores of tools are made in this way. The Lake City toolroom now forges all heading, pocketing, bunter and bullet-sizing dies. Most of these tools are shaped so they could easily be machined from bar stock which, in fact, was the former practice.

The advantage of forging is due to grain refinement through hot working and in "turning the grain around" to obtain vastly superior metallurgical properties. Bar stock grain runs longitudinally, just the wrong way for best tool service. If the grain is made to run crosswise, tool life is greatly improved. That is why so many Lake City tools start in the forge shop.

Forging also contributes to steel salvage. No tool is scrapped if, after being worn below permissible limits, it can be pounded down under a steam hammer to make stock for a smaller tool. Steel that has taken



Forging makes tools tougher because of grain refinement due to hot working and in changing the direction of the grain

Dies are heat-treated in batches in a Char-Mo furnace which eliminates scaling

A brine spout gives quick quenching to harden the inside diameter of draw dies

a beating in the production of thousands of bullets or cartridge cases is salvaged in this way; the usage it gets in a long press run makes it all the more valuable in subsequent service.

When new steel is used for a tool, a piece of suitable size is cut from a bar and normalized by heating it to 1250 F. and cooling in air. Bars 4 in. square are frequently used because they are more readily obtained than rounds. The steel is hammered under a Chambersburg hammer until the length of the piece is at right angles to the original length of the bar.

Tools, such as heading dies, which are cylindrical with a hole through the center are salvaged by sawing them half-way through after annealing. They are then furnace heated and opened with a tapered drift under a steam hammer. Two passes with a semi-cylindrical swage opens them further so they can be flattened under the hammer. They are drawn into a long platter and then hammered into a "biscuit." Sizing for use in other tools is done under a Beaudry trip hammer.

New Tools From Old

Two-thirds of the work in the forge shop is performed on steel that has already seen service in the plant. A common procedure is to use new steel for cal. 0.50 heading dies, rework these dies when worn into cal. 0.50 pocketing dies, rework again into cal. 0.30 heading dies and once again rework into cal. 0.30 pocketing dies.

These heavy-duty dies are made from 3½ per cent tungsten steel with about 1.20 carbon. Smaller dies and most punches use high-carbon tool steel. Dies with thin sections or cupped edges are made from high-carbon, high-chromium steel which can be hardened in oil without fear of causing quenching cracks.

Forged steel is annealed by heating to 1650 F. in a Stewart furnace and, after a soaking period, placing it in a special soaking tub which has been fabricated in the plant. This container consists of a small steel drum welded in place inside a standard 55-gal. oil drum to give about 3 in. of space all around. The space is filled with lime and sealed by welding. The inner drum forms the cooling chamber for annealed work. Each piece placed in it is covered with powdered mica, which minimizes scaling; when the tub is filled with work, the lid is clamped on it. A load is usually left in the tub about 72 hours before opening. Its use avoids tying up the large annealing furnaces for the long periods needed if the charge were furnace cooled. A special dolly has been designed to lift the tubs and move them from place to place. When the forgings are cool, the tubs are emptied by lifting them in a monorail hoist and dumping them

on a steel grating. The mica falls through and can be reused.

For cylindrical tools the stock is forged into bars long enough to make five or six parts. The bars are turned on a Hardinge lathe and then put through a Cincinnati centerless grinder. With the finish thus obtained the bars are gripped in the collet of a Warner & Swasey turret lathe for forming and cutting off. Holes are drilled and reamed in this machine.

Heat-treatment has been carefully determined for all types of tools used at Lake City; a record of the most effective treatment is kept on instruction cards in the hardening room and consulted before each batch of work is started. Large tools are heated in Char-Mo furnaces whose controlled atmosphere eliminates scaling and decarburization. Smaller tools are heated in gas-fired pots using Houghton's N.D. Liquid Heat. Temperatures are closely regulated with automatic pyrometers. Carbon steel tools are heated to 1450 F. and others to temperatures dependent on their alloy content. They are drawn to 375 F. in Lindberg electric furnaces or in gas fired pots using Houghton's Drawtemp. This pot is also useful in softening the shanks of certain tools.

Special racks have been devised for holding tools in batches during heat-treatment. Typical of these devices is one for holding 50 dies. It is made simply by folding a piece of heat-resistant stainless steel plate back over itself to form a box section and welding the ends together. Holes to receive the dies are drilled in the upper part of the plate while the bottom is left solid.

Brine Spout Quenches Bore

Except for tools made from the high-carbon, high-chromium steel, most quenching is done in brine. Where the inside diameter is the working surface, the hot die is placed over a brine spout which quickly cools the bore leaving the outside ductile. Most tools required a hardness of 62-64 Rockwell C on their working surfaces.

Mirror finish is obtained on tools at Lake City by polishing them before and after heat-treatment. The pretreatment polish is especially important since it removes tool marks that would be difficult to get rid of after hardening. Various polishing compounds are employed at Lake City. Usually the process is started using Minneapolis Mining No. 400A abrasive

Careful polishing to remove tool marks is one of the secrets of long die life

Diamond dust and olive oil applied with cotton batting give a fine mirror finish

All tools are inspected for hardness on a Rockwell testing machine

cloth. Tripoli and Carborundum No. 45 lapping compounds are used successfully on many types of tools. For some of the tougher cases, diamond dust and olive oil are applied with cotton batting to give a fine finish in a comparatively short time.

Much of the polishing is done in Cincinnati Electric polishing heads. Some of the work must be done with the tools held stationary in a vise. This is true of bullet and cartridge case punches, where polishing marks must run with the length of the punch. Chromium plate does not lessen the need for a high finish on the steel. On other tools buffing wheels afford a quick and effective means of polishing.

All this work must be done to get a mirror finish without removing too much material from the tool; otherwise it will be undersize. To trace the care taken in toolmaking at Lake City the sequence of operations is given for the cal. 0.30 bunter. This tool flattens the head of the cartridge case after the heading operation and marks it with the tiny identifying letters that appear around the primer. The center of the tool carries a tit which gives the final sizing to the primer pocket. The tool is made of 1.10 straight carbon steel.

The Lake City toolroom works 24 hours a day, seven days a week. Only a small percentage of workers are toolmakers; most of them are new to shop work, and many of them are women. Yet, they turn out tools on a production basis that are breaking all previous records of performance. The answer lies in close attention to detail, good supervision and thorough inspection.

TYPICAL TOOLMAKING PROCEDURE

Cal. 0.30 Bunting Die

Forge steel to 15 in. lengths
Anneal
Center and turn in engine lathe
Grind on centerless machine
Turn and cut-off in turret lathe
Soft polish
Coin head in 85-ton hydraulic press
Stress anneal
Indicate seat and turn O.D.
Reverse and turn bottom, end and tit
Harden and draw
Indicate and grind tit
Reverse, chuck from tit and grind body using center in the bottom
Grind tit to length
Polish
Inspect

How to Run an ENGINE LATHE

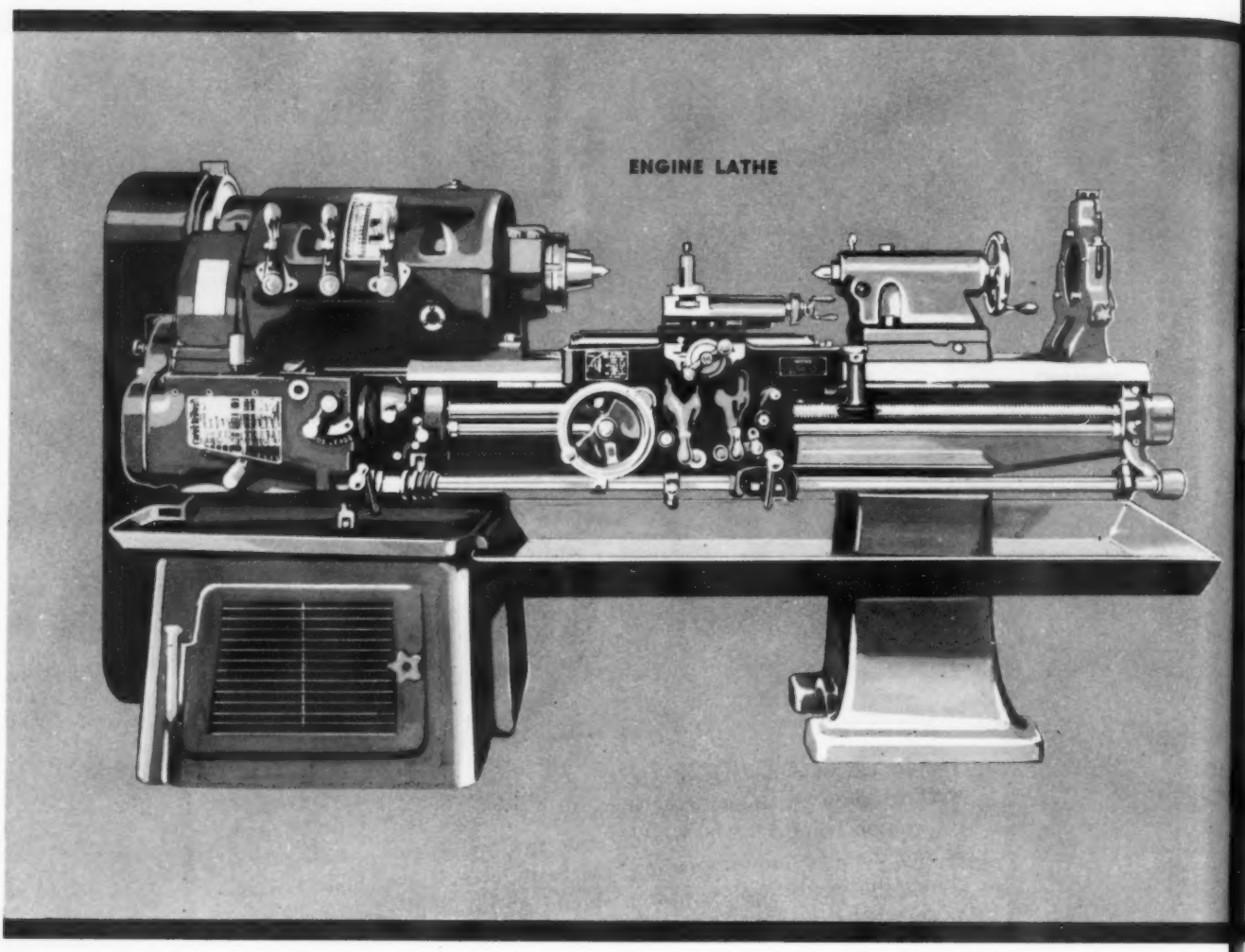
The fourth in our series of articles designed to speed the training of wartime shop personnel tells the story of man's most versatile tool, the engine lathe. Like its predecessors, this article gives the beginner, or the candidate for upgrading, the basic information about the machine: the way it works, how it should be handled, what it will do. With this background he should be ready for rapid on-the-job training. If you can use this information, reprints are available from the Editor, AMERICAN MACHINIST, 330 West 42nd Street, New York, N. Y., at 10 cents a copy (less in lots of 500 or more).

WHEN MAN first began looking around for easier ways of doing things, he soon stumbled on the basic principle of the lathe—the idea that a cylinder may be formed by rotating the material on its axis while a cutting tool is held against it. The village potter used this idea when he mounted a lump of clay on his wheel and spun it into shape. And the early cartwright found it a valuable means of hewing out the axles for his crude wagons.

From such primitive beginnings has sprung the entire tree of machine tool development. Almost all the machines used in making our engines of war and peace began here. The direct descendants are the family of lathes—bench, engine, turret and automatic types. But drill presses, boring mills, cylindrical grinders and various special machines are all offshoots of this single invention.

However, it is the lathe family that concerns us here, particularly the form known as the engine lathe, probably the most versatile tool in the metal-working industry. With metal-working lathes cylinders as small as the shaft of a watch or as large as the giant guns in a battleship's turrets may be turned to shape and size. Outside and inside diameters may be cut and parts drilled, bored, and reamed to size. Outside and inside tapers may be formed, threads cut, and with special attachments, gears and other milled parts may be shaped and cylindrical surfaces ground to a fine finish.

Though in high production much lathework is done on turret lathes and various types of automatics, the basic principles involved in these machines are found in the engine lathe. Thus an operator skilled in engine lathe practice has a fine beginning for future training for turret or automatic lathe set-up and practice. He need only learn the tools and controls of the particular machine he will operate.



The Machines

The component parts of a typical lathe are found in their simplest form in the bench lathe. This is a precision machine for toolroom work or for small parts manufacture. Sometimes it is a small edition of the engine lathe with power feeds and thread-cutting gears. In its simpler form, however, it consists of a precision headstock, tailstock and compound toolrest mounted on a finely finished bed.

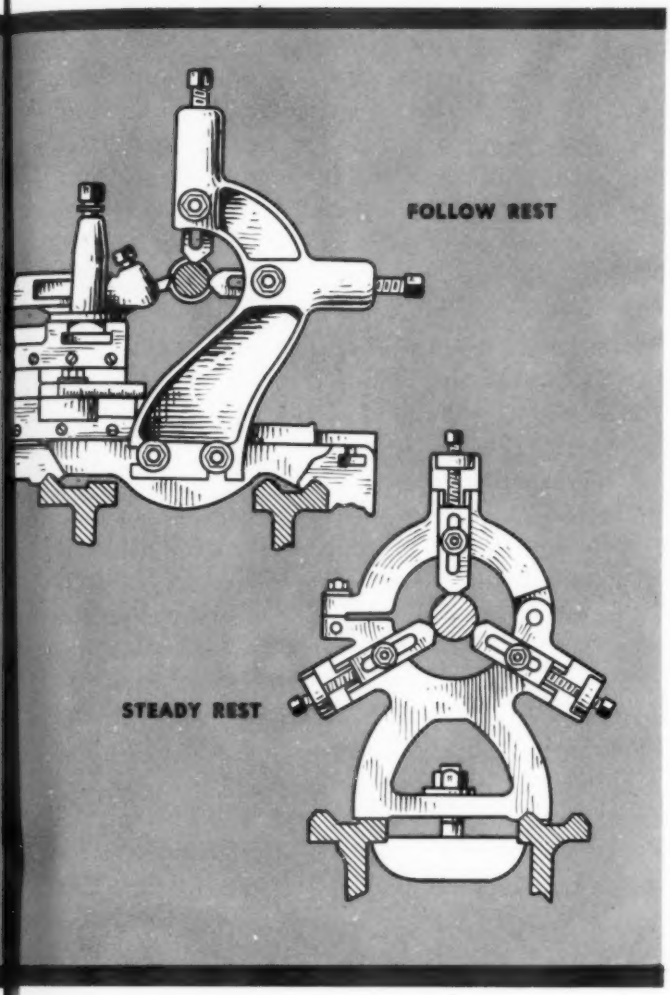
The headstock transmits power from the driving motor to the work. The older types contained a series of belt-driven pulleys of different sizes to give a variety of spindle speeds. More modern lathes have variable speed motors or geared headstocks. Power is applied to a spindle which runs in very accurate bearings. Centers, collets, chucks or faceplates may be mounted on the spindle nose to hold the work and transmit power to it.

The tailstock is a rigid casting which holds a center to support the free end of the work or such tools as drills, reamers, taps and dies when they are used on the free end. The center or tool is held in a spindle which can be advanced or retracted by a hand-fed screw. The tailstock can be moved back and forth on the ways of the lathe bed and can be locked in the desired position.

Turning tools are held in a compound rest mounted on a carriage between the headstock and tailstock. The carriage can be moved along the ways and clamped at a convenient position. The compound rest consists of two hand screw feeds. One moves the tool in and out at right angles to the ways. The other swivels about so that the tool can be fed parallel to the ways or at any angle. The cutting tool itself is held in a post which fits a T-slot in the upper surface of the compound rest.

The lathe bed forms a support for the headstock, tailstock and carriage. It is a rigid casting having a hardened and scraped upper surface, usually having two or more V-shaped or flat ridges, or ways, on which the tailstock and carriage ride.

The engine lathe has the same basic parts as the bench lathe with the addition of mechanisms for feeding the tool by power to and along the work at predetermined rates. As in the bench lathe, the head-

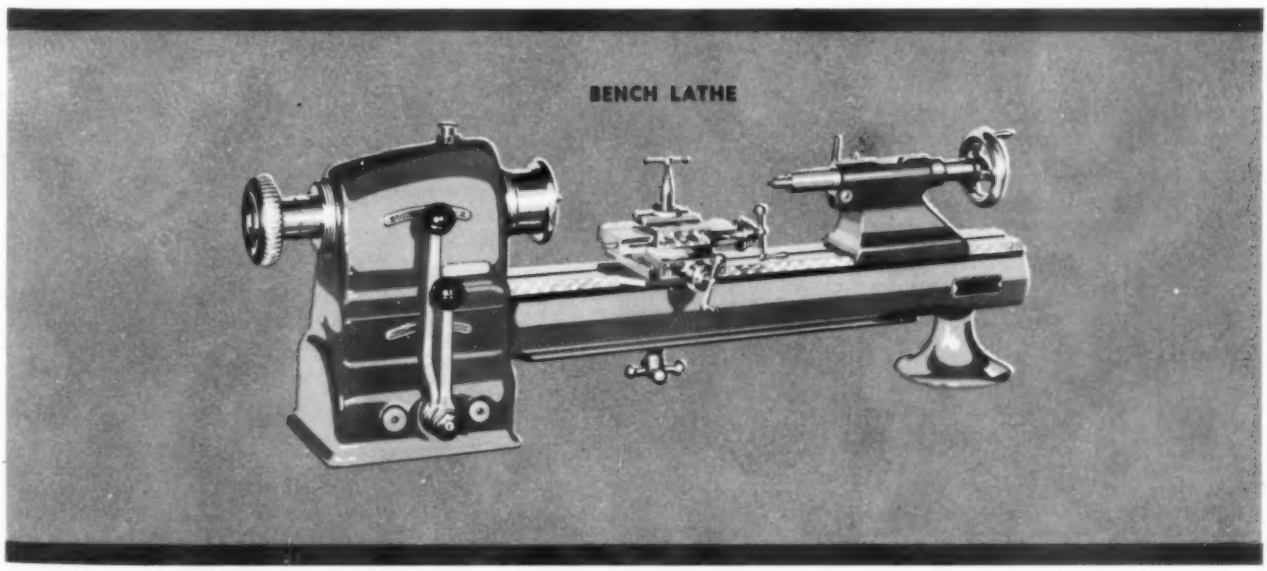


stock may contain a series of step pulleys, or, in more modern machines, a geared transmission which can be shifted by a simple lever arrangement to give anywhere from 9 to 32 spindle speeds.

The head end also incorporates combinations of gears to transmit power to the compound rest or carriage. Two connections between the gears and the carriage are provided. One, the feed rod, is a straight shaft to which a gear in the carriage is keyed. This powers the cross and longitudinal feed for most turning operations. The other is an accurately machined screw which is used to give a positive longitudinal feed for cutting screw threads.

To accommodate the feed mechanism, the carriage is built with an apron extending down the front of the machine. This apron contains the feed gears and feed controls. These controls usually include a handwheel to move the carriage back and forth along the bed, levers to engage the longitudinal and cross feeds, a half-nut lever to engage the screw-cutting feed, and levers to control the starting, stopping, and reversing of the carriage travel. The compound rest itself has ball cranks or handwheels to provide a hand feed for cross and angular movements, while the entire rest can be moved across the ways by a cross-slide handwheel.

The tailstock has the same design as that of the bench lathe but is, of course, proportionately heavier. It performs the same functions. A supplementary work rest, called a steady rest, is usually supplied as standard equipment with engine lathes. This fits around the work to hold a cylindrical piece by its circumference. It is used to support the center portion of long work to keep it from springing, or to hold the end of long pieces when the end surface must be free for cutting operations. Another type of rest, a follower rest, is fastened to the carriage to oppose the action of the cutting tool when long thin sections are being turned.



Work Held Between Centers

The primary method of holding work in a lathe is to mount it between centers. To do this, holes with countersunk bearing surfaces are drilled in the ends of the workpiece. A lathe dog is clamped on the drive end of the work so that the tail of the dog engages a slot in a driver plate mounted on the spindle nose. The dead center mounted in the tailstock is then moved up and into the center hole of the free end. The dead center should fit the countersunk hole just loosely enough so the work will revolve but not so loose that it will wobble. A little white lead and oil should be placed on the dead center to lubricate the bearing surface.

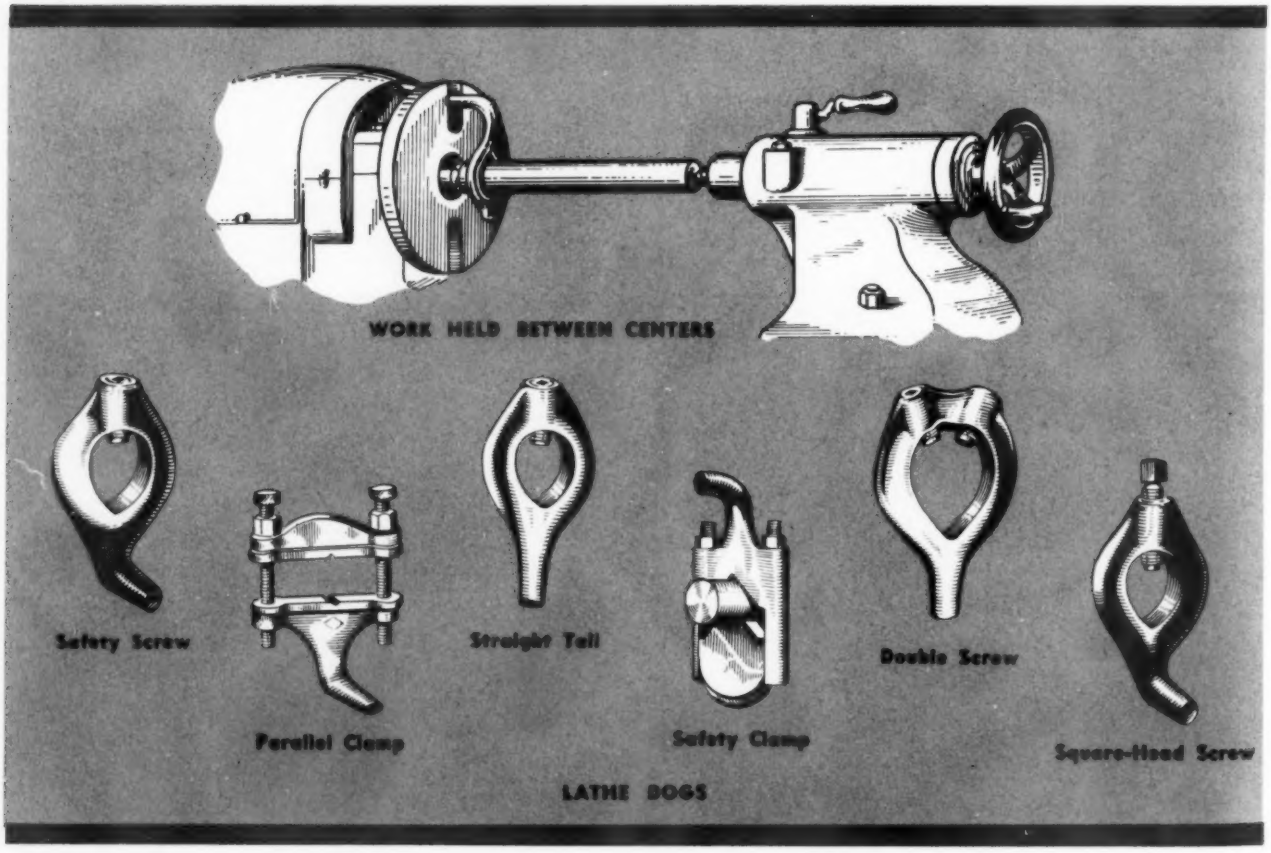
In many high-production shops, work is centered in a centering machine. This is a device having equalizing jaws which automatically center the work for a drill spindle. Center holes can then be drilled and countersunk without first being laid out.

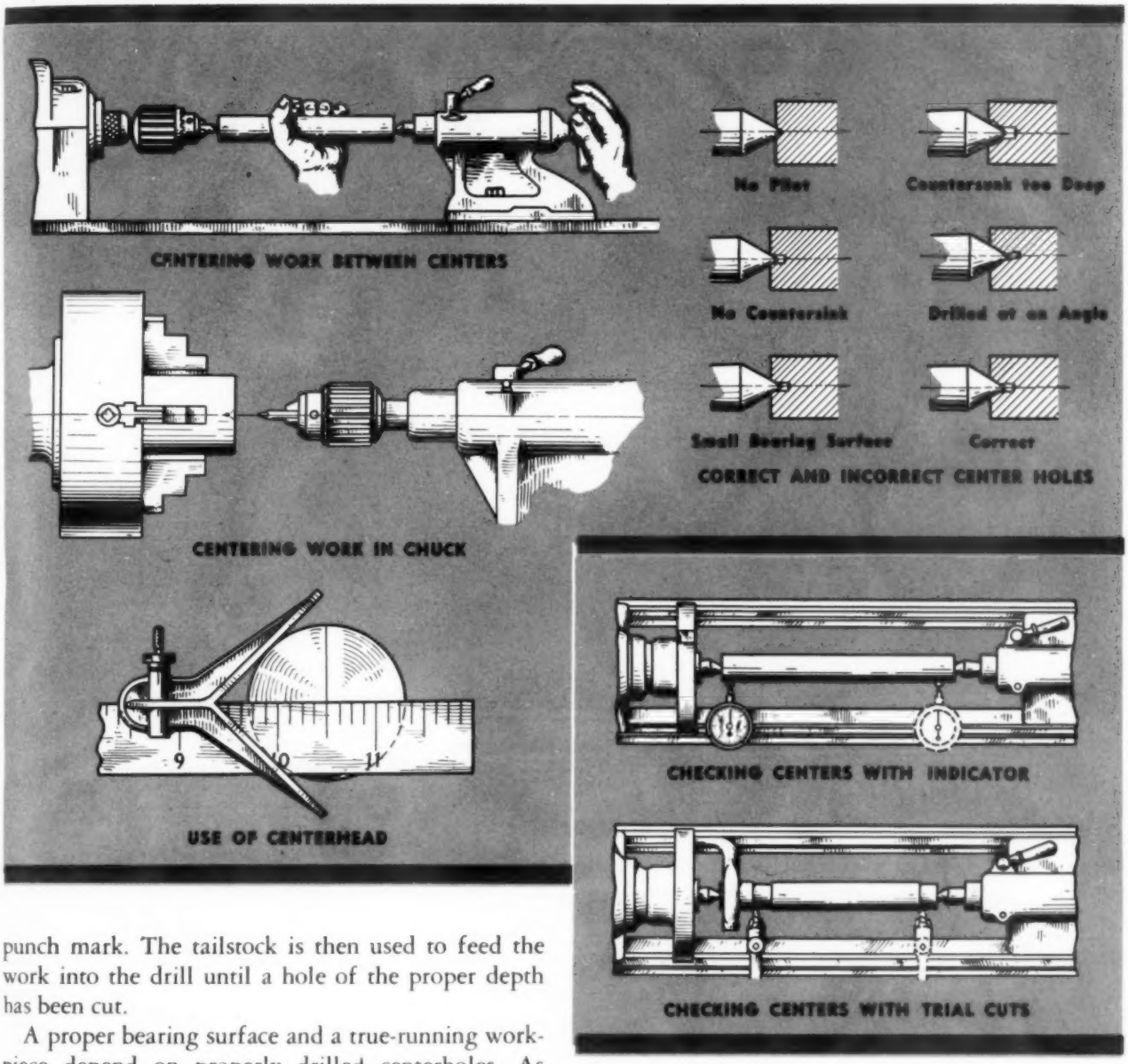
Where no centering machine is available, short pieces may be centered by mounting a combined drill and countersink in a drill chuck held in the tailstock. The piece is held in a chuck mounted on the spindle nose. When it runs true, the tailstock can be moved up to the work, clamped in place, and the drill fed into the work by the tailstock handwheel. With longer pieces, the free end may be held in a steady rest while being drilled.

On long pieces, the centers of the piece must usually be found with layout tools. The easiest and most accurate method uses a centerhead and rule. The work is placed in the angle of the centerhead and a line is scribed along the rule. The centerhead is then moved 90 deg. and another line is scribed. The two lines should intersect at the center of the piece. Where greater accuracy is required, it may be necessary to scribe lines at four positions so that two pairs of parallel lines result. The center of the work will then be at the center of the square formed by their intersections.

A hermaphrodite caliper may also be used to find the center. The caliper is set at slightly more than half the diameter of the work. The bent leg is placed against the circumference of the piece and four arcs are struck on the end at 90-deg. intervals about the work. The center is then found by drawing the diagonals connecting the intersections.

When found the centers are prick punched and the center holes are drilled. This may be done by mounting a drill chuck holding a combined drill and countersink in the lathe spindle. The tailstock center is placed in one center mark and the work and tailstock are moved up until the drill centers in the other





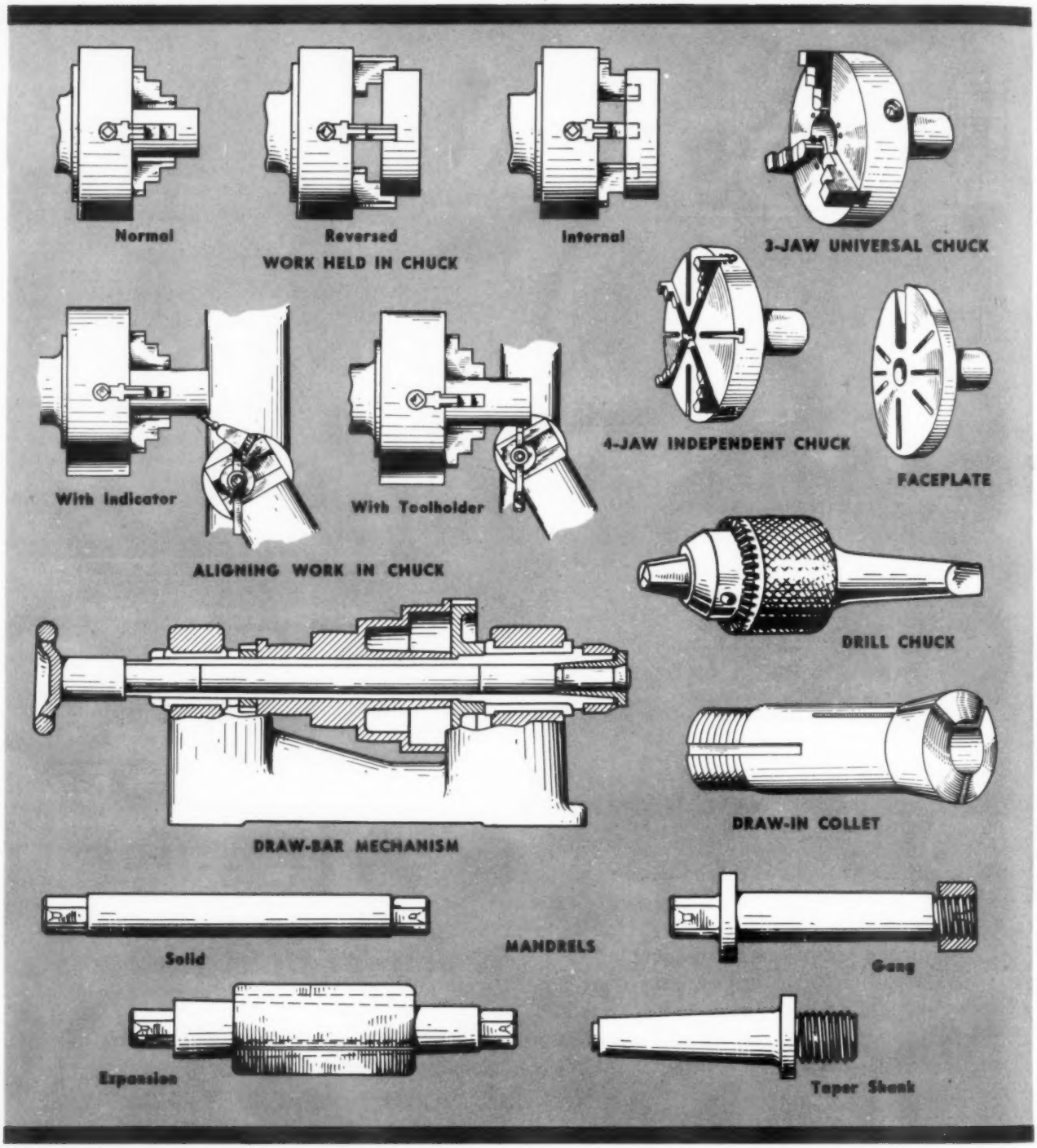
punch mark. The tailstock is then used to feed the work into the drill until a hole of the proper depth has been cut.

A proper bearing surface and a true-running workpiece depend on properly drilled centerholes. As shown in the illustration, the drilled hole should extend far enough beyond the countersunk hole to allow clearance for the point of the center. The countersunk area should be large enough to give a good bearing surface yet should not be so deep as to form a ridge at the end surface. The included angle should be exactly 60 deg. And, of course, the hole should be drilled straight and on center.

The accuracy of work held between centers depends on the condition and adjustment of the centers. This should be checked before any cuts are made. The centers should be smoothly finished to an exact 60-deg. point, with no cuts or burrs. If they are marred, they should be replaced or reground. If they are in good condition, the adjustment may be checked by moving the tailstock up until the dead center meets the live center. The position of the dead center may then be adjusted by setting the tailstock over by means of the screw in the base until the live and dead centers are aligned as accurately as possible by eye.

A test bar, an accurately machined and centered cylinder, should now be inserted in the lathe. An indicator is mounted in the tool post and readings taken at both ends of the bar. If there is a difference between the readings, the tailstock may be adjusted until the difference disappears.

The alignment may also be checked by taking trial cuts on a test piece. An accurately centered cylinder is placed in the lathe and a cut is taken at one end. The graduated dial on the compound rest is then set at zero and the tool withdrawn from the work and traversed to the other end of the piece where a second cut is taken by running the tool in until the dial again reads zero. The diameters of the turned sections should be identical if the centers are in line.



Work Held in Chucks

The second chief method of holding lathe work is to grip it in a chuck or collet. Three types of chucks are generally used: large three-jaw universal and four-jaw independent chucks, which screw on the spindle nose, and a small universal chuck with a tapered arbor. The three-jaw chuck is so made that all three jaws are moved by a single screw. When the chuck is in good condition, it will center work accurately. If it is a little worn, it may be necessary to place metal or paper shims of different thicknesses between the work and the jaws in order to hold the work on center.

In the four-jaw chuck, each jaw operates independently. This makes for slower but more accurate centering. It also allows parts of irregular shape to be held in the chuck. For holding large work or for gripping the work by an inside diameter, the jaws of the independent chuck can be reversed. With uni-

versal chucks a second set of jaws is usually necessary. With both types, jaws are available with hard faces for gripping rough work or soft faces for finished work.

The small universal chuck, often called a drill chuck, is more frequently used for holding tools than work. It may be mounted in either the spindle nose or the tailstock.

The trueness of a workpiece mounted in a chuck can be tested by bringing the butt end of a toolholder up to the circumference of the work and rotating the chuck slowly. By watching for variations in the gap between the toolholder and work any tendency of the workpiece to run out can be noted. If great accuracy is required, an indicator may be mounted in the toolpost and brought to bear on the circumference. The run-out can then be measured to 0.001 in. and adjustments made.

Small bar work is often held in collets. These are small solid tubes having an internal diameter only slightly larger than the piece to be held. The tube is slotted for about half its length so that when its tapered outer section is forced against a taper in the spindle nose, the collet clamps down on the work. Because of their limited capacity, collets are made up in sets to take standard sizes of stock.

The commonest form of collet is probably the draw-in type, where the collet is pulled back against the nose taper by a draw-bar. Push-out collets are pushed forward against a taper, while other types are held in special collet chucks.

Faceplates

Irregular parts, which cannot be held in a chuck or mounted between centers, must usually be held on a faceplate. The work may be clamped to the faceplate, or in quantity production a special fixture may be designed to hold the piece. When clamps are used, considerable time must be spent in centering the work. For this reason, clamping is chiefly used in small-lot toolroom work.

Mandrels

When parts have holes bored or drilled through their entire length, they are usually held on mandrels. The simplest form of mandrel is a hardened and ground shaft which tapers from slightly less than the diameter of the hole to slightly more. The small end is placed in the work and the work is forced on the mandrel until it binds. The assembly is then held between centers just like straight cylindrical work.

Since solid mandrels must be made to exact sizes and are subjected to considerable wear in use, various types of expanding mandrels have been developed. These have a somewhat wider range of fits and adapt themselves to take up wear. If the part has a threaded hole, a mandrel can be used which has a similar thread abutting in a shoulder. Where the face of the work must be turned, a mandrel having a tapered shank to fit the spindle nose is a useful type.

Turning Tools

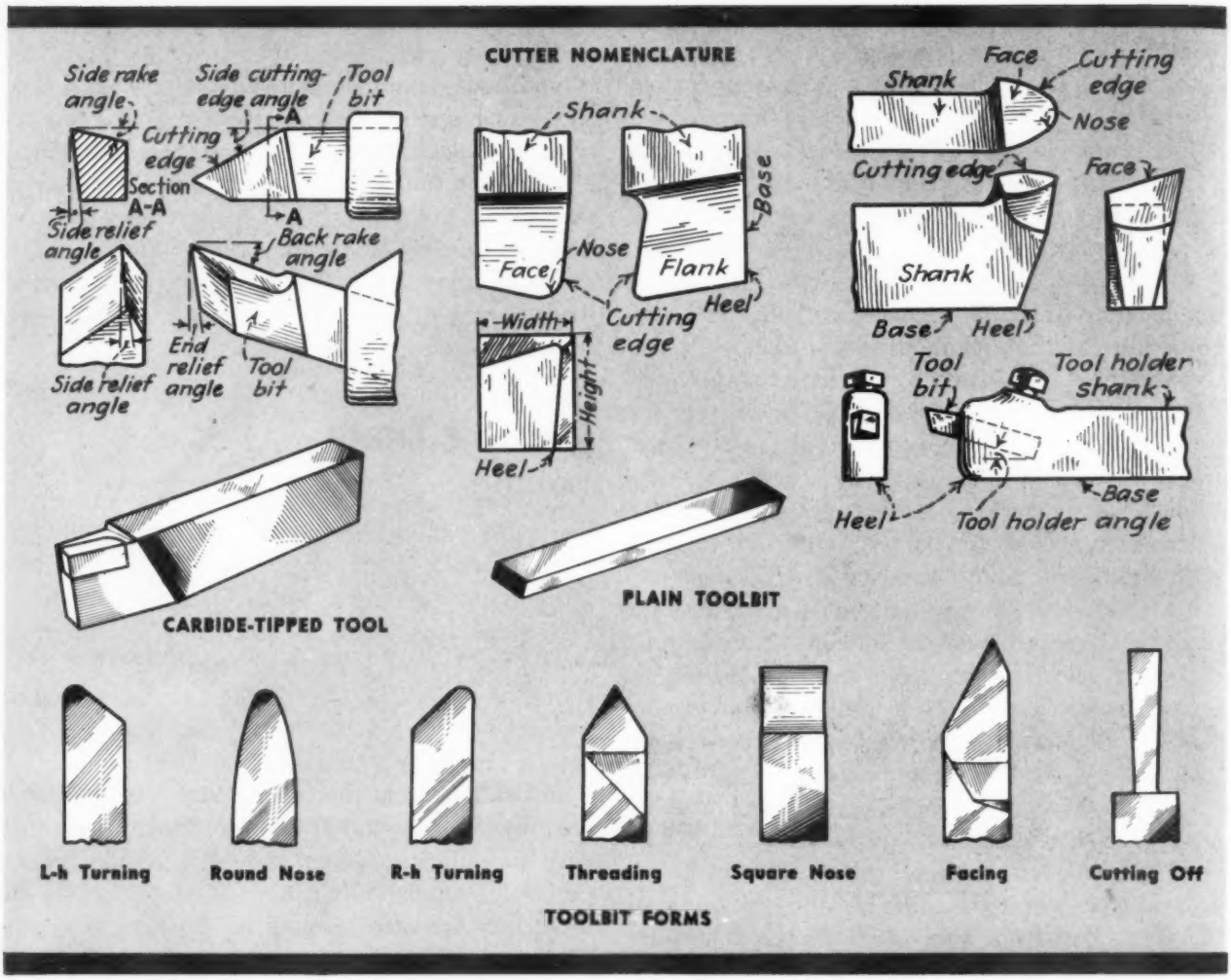
The cutting tool used in lathe work consists of a sharpened toolbit held in a forged steel toolholder for small work or a solid forged steel tool. For most turning operations the toolbit has been made of high-speed steel. This is still probably the most widely used cutting material, especially for slow-speed work. For high-speed high-production work, special alloys such as the tungsten carbides and Stellite are replacing high-speed steel.

In order to form the cutting edge, certain angles are ground on the end of the tool. These angles vary with the material to be cut and the material of which the tool is made. When high-speed steel tools are used, they are often ground by the lathe operator. Carbide-tipped tools, on the other hand, are usually prepared by trained grinders in the shop toolroom. For this reason, the following discussion will be limited to high-speed steel tools.

The cutting action of the tool is largely supplied by the back and side rake angles. The slope at which

TOOL ANGLES
FOR HIGH SPEED STEEL CUTTERS

MATERIAL	Back Rake	Side Rake
Cast Iron	8	14
Copper	10	25
Brass, Soft	0	0
Hard Bronze	6	5
Aluminum	30	15
Magnesium	15	5
SAE Steels:		
x1112 Screw Stock	15	20
1020 Carbon Steel	15	15
1045 Carbon Steel	10	12
1095 High Carbon Steel	5	10
3140 Nickel Chromium (Annealed)	10	12
4140 Chrome Moly	10	12
4615 Nickel Moly	15	15



this top surface is ground depends on the resistance to cutting of the work material. If it is hard and tough, the rake angles are small so that the cutting edge will have all the support possible. If the material is soft, the rake angles may be large so that chips will flow from the work easily. For materials like brass, the tool is ground with no rake angle or a slight negative angle to keep the tool from biting too deeply into the work.

The full rake angle is not ground on the toolbit. Since the bit is held at a 20-deg. angle in the toolholder, it is only necessary to grind the bit enough to obtain the required variation from this 20-deg. angle.

Several tool shapes have been devised for particular turning operations. The most useful is the right-hand turning tool which is used for most external cutting. This tool is ground with the cutting edge at an angle so that the tool can be set to oppose the cutting action as the tool feeds from right to left. The left-hand tool is just the reverse of the right-hand tool. Both are ground with a radius on the point; about 1/16 in. radius for roughing cuts, 1/64 in. radius for finishing.

Side facing tools are made for finishing the ends of a turned section. These are ground with a sharp point so that they cut a sharp corner at the base of a shoulder. They are made with either right- or left-hand cutting edges.

When a piece is to be cut from the work, a cut-off or parting tool is used. This has a square nose which tapers back towards the shank to prevent friction between the tool and work. Relief is also ground on both sides. Cut-off tools are also made in the form of a tapered blade which is held in a special toolholder.

Threads are cut with specially ground tools. For National Standard threads, the tool is ground with a 60-deg. point. The face is usually ground flat and the end is relieved at both sides. This tool will cut most pitches of threads. Square and Acme threads must be cut with tools made especially for each size of thread.

For boring, the toolbit is usually held at the end

of a cylindrical bar. Boring tools have the same shape as tools for straight turning, except that, because of the limited space in which they work, the end relief is usually much greater.

Lathe toolholders are made in a variety of forms. The straight toolholder can be used for most external turning jobs but other forms have been developed to perform particular functions better. Right- and left-hand toolholders, which have the bit end bent at an angle to the shank, can be set off from the toolpost so that they do not interfere with the work. Special toolholders are made for boring tools, cut-off tools, threading tools, and so forth.

Turning Operations

The chief cutting operations in lathe work are turning, facing, boring, taper turning and threading. Minor ones include drilling, reaming and knurling.

TURNING, as a general term, applies to all types of work in the lathe, but specifically it refers to cutting external cylinders. The tool most commonly used is the right-hand turning tool. This is ground to suit the particular material to be cut. For rough turning, it is usually ground with a large radius on the point; for finish turning, the radius is smaller and the cutting angles are honed to a smooth, keen edge.

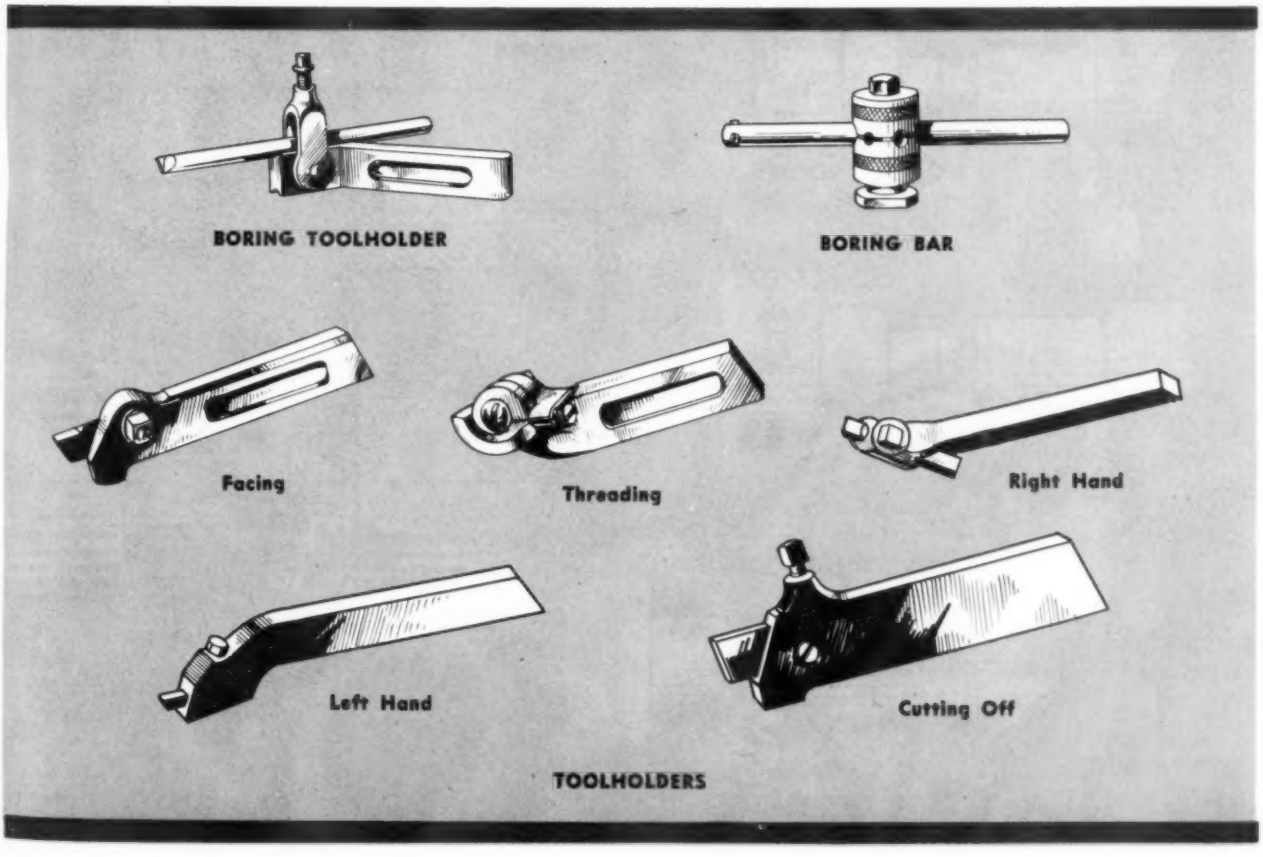
When a toolbit is used, it is held in the holder so that only a short section projects and the toolholder is held in the toolpost as near the cutting end as possible. This is necessary to assure a rigid set-up and prevent chatter.

The tool is adjusted in the toolholder so that the cutting edge is on or slightly above the center of the work (about 1/32 in. above center for each inch of diameter). For heavy roughing cuts the tool is inclined slightly towards the tailstock so that it will be forced away from the work rather than into it, preventing any tendency to undercut.

When the tool is set up, the carriage is traversed along the work to make sure that it will not strike the work or the holding device.

Most turning operations are performed with one or two roughing cuts and one finishing cut. Roughing cuts may be as heavy as the machine, tool and work will stand. They should not leave the surface so rough that a light finishing cut will be unable to clean up the surface.

In turning, the tool is usually fed from right to left. For fine work, it is advanced to the surface of the piece and the graduated collar is set at zero. The tool is then advanced to the depth of cut estimated as best for the job. This depth can be read directly



TOOLHOLDERS

in thousandths of an inch on the graduated collar. (It should be remembered that an advance of 0.001 in. on the graduated dial means 0.002 in. reduction in diameter.)

When the tool has been advanced far enough, a short trial cut is taken using the longitudinal hand feed. The lathe is then stopped and the diameter of the cut portion is checked with a caliper to make sure that sufficient stock has been left for the finish cut (about 1/32 in.). If the diameter is all right, the power feed is engaged and the cut taken.

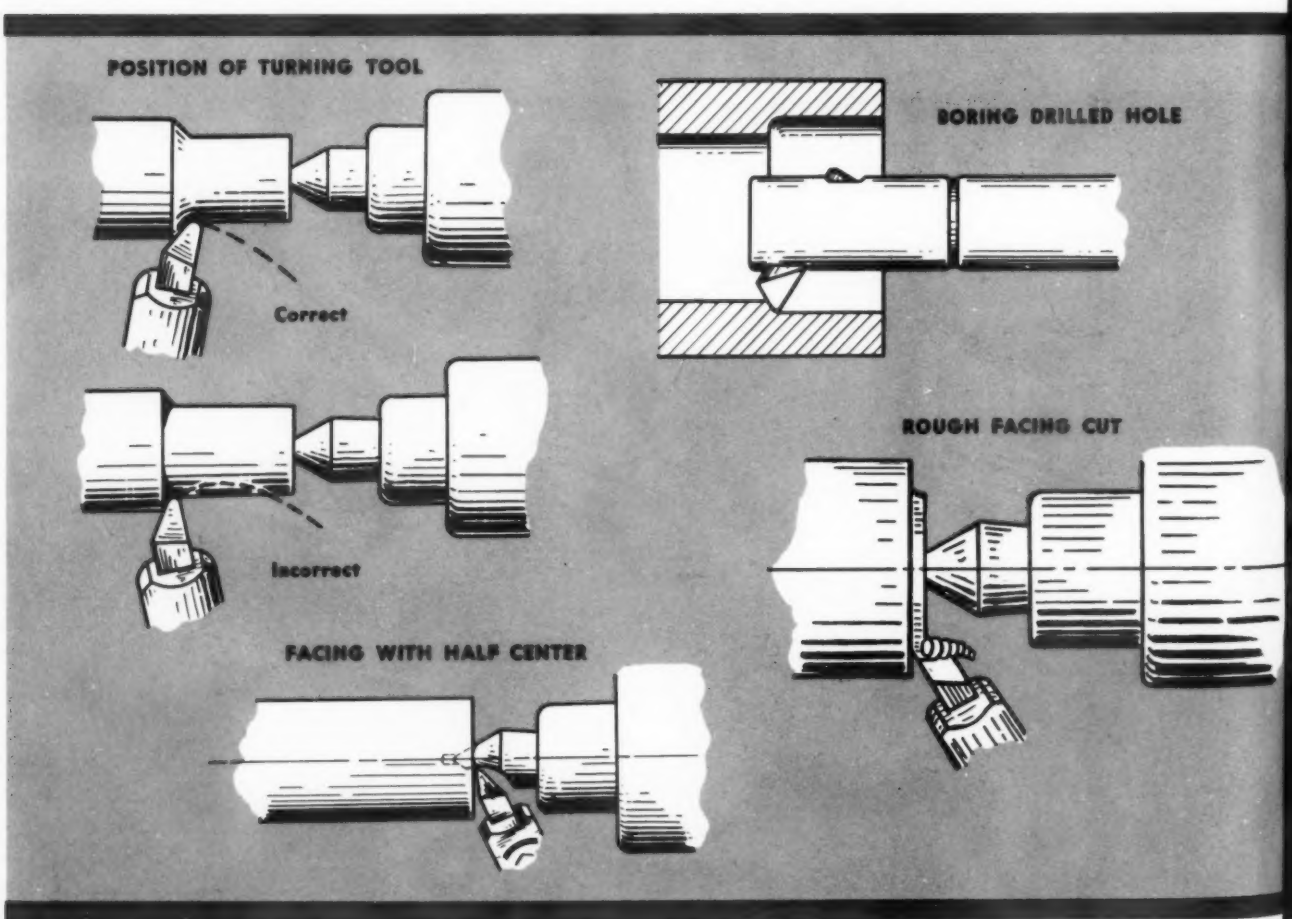
The roughing cut or cuts having been made, a finish cut is taken. The roughing tool is removed from the toolpost and a finishing tool inserted. The tool is advanced to the work and the dial set at zero. A very light cut is taken for a short distance along the work. The diameter is then measured with a micrometer.

By the use of the graduated dial, the tool can now be advanced half the difference between the measured diameter and the required diameter and a second trial cut be taken. Any necessary adjustment should be made now before the power feed is engaged and the final cut made. For finishing cuts the feed should be decreased and the speed increased.

If the full length of the piece is to be turned, roughing cuts are taken almost up to the lathe dog. The piece is removed from the lathe and turned end for end, the lathe dog being placed on the rough turned end. The remaining length is then rough and finish turned. The piece is then returned to its original position and the first half finish turned. This procedure is necessary in order to finish the section on which the lathe dog fastens.

FACING is the operation of cutting the end surfaces of a turned section at right angles to the axis of the work. Where the work must be faced down to a sharp corner, a sharp pointed facing tool is used. For the ends of a shaft, either facing or turning tools may be used. When the end of a piece held between centers must be faced, a center which is partly ground away may be used in the tailstock to allow more clearance for the tool.

If considerable stock is to be removed, the end is first rough faced using a hand feed from the circumference of the work toward the center. Finish cuts are made with the power feed, starting the cut at the inner diameter and bringing it out to the circumference. Tools for finish facing should be honed smooth with a small radius on the point.



In order that no nubbin be left at the center of the piece, the facing tool must be set exactly on center. If the tool is set too low, it will pass under the center, leaving a projection twice the size of the offset. If it is set too high, it will rub against the projection, springing the tool or the work.

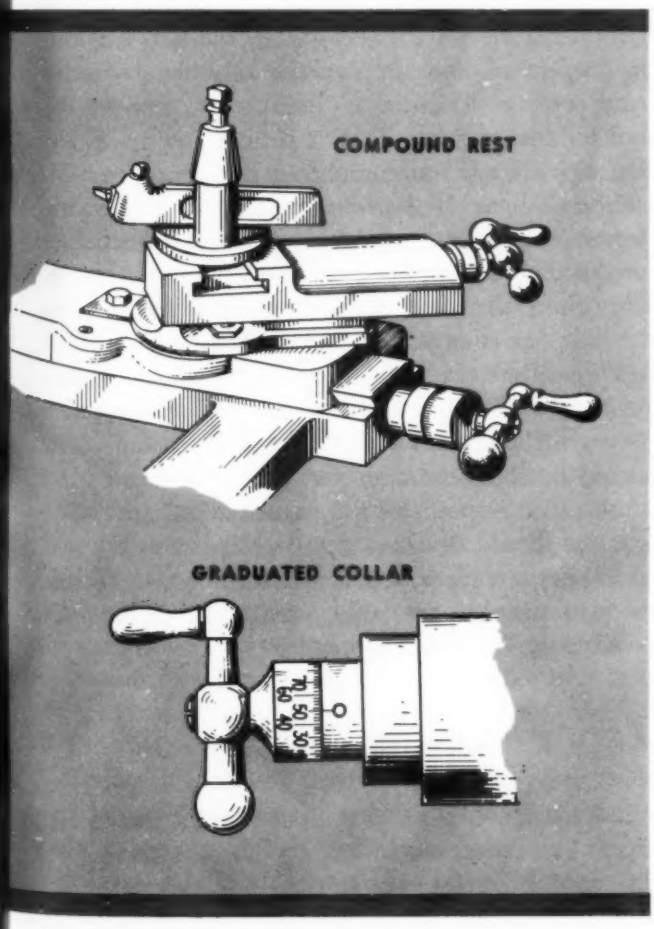
BORING is the term usually applied to internal cutting with a single point tool. It is the chief means of truing and enlarging drilled holes. The tool used is either a short toolbit inserted in a cylindrical bar or a forged tool having a long thin neck.

The cutting edge of a boring tool may be ground in the same shapes as external turning tools. If the bored section must end in a square shoulder, the tool is ground with a sharp point to face a square internal corner on the shoulder. When a smooth finish is required, a radius is ground on the point. The end relief on a boring tool depends on the diameter of the drilled hole: the smaller the diameter, the greater the relief. To insure rigidity, the largest tool that will clear the hole should be used.

The boring tool is held short in the toolholder so that it only projects far enough to complete the operation. The cutting edge is set at the exact height of the lathe center, so that the dial gradations on the cross feed will read accurately in thousandths of an inch.

Since most of the stock is removed from the piece by drilling, boring is usually limited to a finishing operation. Ordinarily, 1/32 in. is left by the drill for the boring tool but 1/16 in. or more may be necessary. If much stock must be removed, more than one cut will probably be required since the unsupported boring bar has a tendency to chatter under heavy cuts.

A short trial cut is taken and the diameter of the bored hole is checked before the longitudinal feed is engaged. A number of trial cuts may be necessary to obtain the final required diameter.



Thread Cutting

Thread cutting is an important function of the engine lathe. It is made possible by establishing a positive relation between the rotation of the spindle and the feed of the carriage. For example, if a screw is to have eight threads per inch, the spindle should rotate eight times while the carriage is moving exactly one inch.

The relation between the spindle speed and carriage feed is determined by a series of gears in the lathe head. In older types, the gears are changed by removing the spindle gear and screw gear and replacing them by a pair which will give the desired relation of speed and feed. In more modern lathes, a permanent geared transmission is supplied. This has levers which can be shifted to give the proper selection of gears. A table of gear changes is usually mounted on the lathe to tell the operator how the gears are to be shifted.

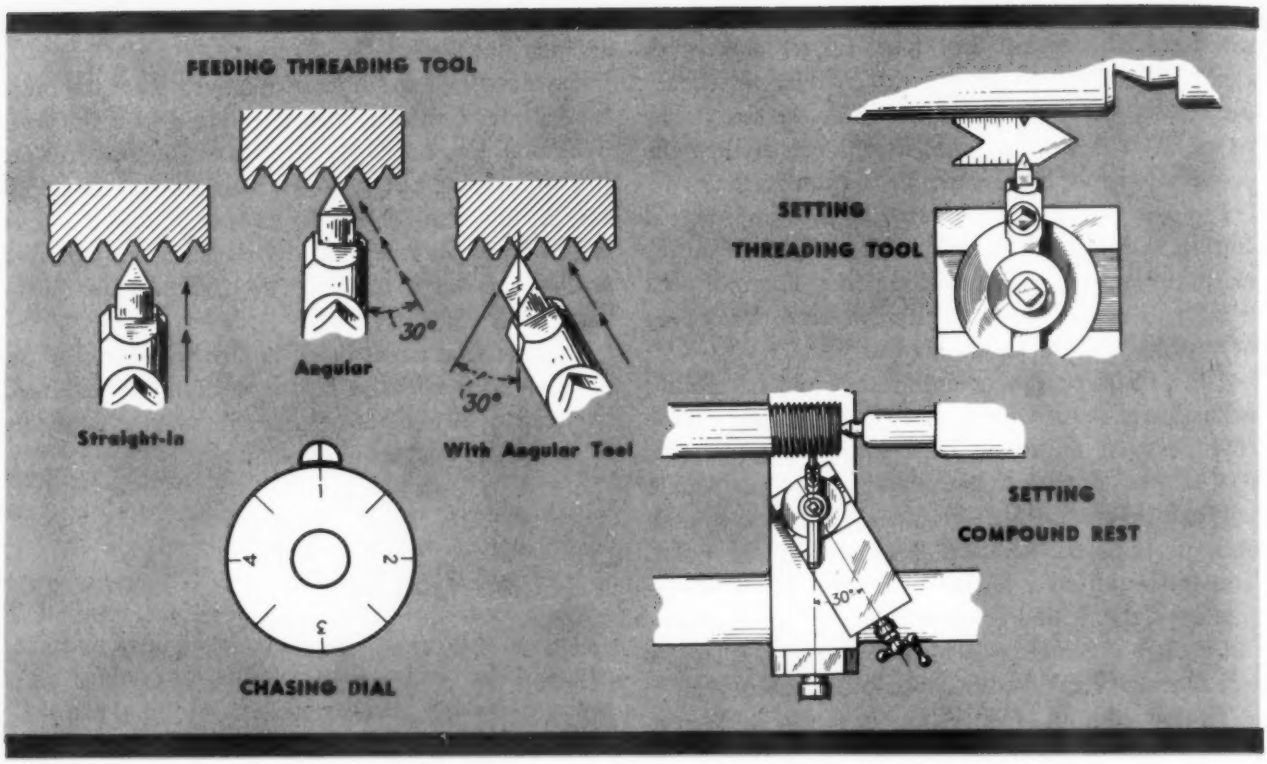
The ratio of gear sizes for the old-style gear change can be found from the formula

$$\frac{\text{Lead number}}{\text{No. of threads per inch}} = \frac{\text{Gear on spindle stud}}{\text{Gear on feed screw}}$$

The lead number is the number of threads that are cut when there are equal gears on the stud and screw.

The style of tool used in thread cutting is determined by the nature of the thread to be cut. Special forms are ground for National Standard, Acme, square, Whitworth and other types. The thread most commonly used in America is the National Standard. This is a 60-deg. V-shaped thread having a small flat at the top and bottom of the V.

The tool used to cut National Standard threads is ground to an accurate 60-deg. V. It is relieved at the end and on both sides so that a cross-section parallel to the top surface will always show a perfect



V form. The cutting face of the tool is ground with whatever rake the material to be cut requires.

In order to cut an accurate thread the tool must be set so that the centerline of the V is exactly perpendicular to the axis of the work. This is done by placing the edge of a center gage against the workpiece and adjusting the cutting tool until it fits exactly into a 60-deg. V in the side of the gage. The tool must also be set squarely on center.

Threads may be cut with the tool set squarely in the toolrest and the top slide of the compound set to feed squarely across the ways. However, better cutting action is obtained if the top slide is set at an angle of 30 deg. In this way, most of the cutting is done by the left edge of the tool so that advantage can be taken of rake angles. A special tool, having the centerline of the V 30-deg. off center, is sometimes ground to take advantage of angular feeding. On the final finish cut, the tool is fed straight into the work in order to remove any tool marks from the right face of the thread.

The screw-cutting feed is engaged with the half-nut lever. This tightens a pair of half nuts on the leadscrew. The half nut is left disengaged for the slow feeds required by straight turning and is only brought into play for screw thread work.

In order to preserve a fine finish on the thread, the thread is generated by taking a series of fine cuts. Since the relation between speed and feed must not be disturbed, the half nut is usually kept in engagement until the thread is finished. At the end of each cut, the lathe is reversed and the carriage run back with power traverse.

If the lathe has a chasing dial, the half nut can be disengaged and the carriage returned by quick hand traverse. The dial is then used to line up the tool for the next cut. As it is customarily made, the chasing dial has four numbered lines and four unnumbered lines. If the number of threads per inch is even, the half nut can be engaged whenever a line on the dial is opposite the index mark; if odd, at every numbered line. If half threads are being cut, the half nut is engaged at any even numbered line.

Threads are cut with a fine feed and slow speed. As many as 20 cuts may be necessary to finish a screw having eight threads to the inch. The cutting speed should not be more than a third or a fourth of the finish turning speed for the particular material. The first cut should be taken very lightly, so that it just scratches the surface. A scale can then be held against the workpiece to check the number of threads per inch before the thread is cut.

Taper Turning

TAPERS are turned in a number of ways. Short steep tapers can be turned by use of the compound rest. The tool is set roughly at right angles to the rest, and the rest is set at an angle equal to the angle of

the taper. This is done by loosening the clamping screw on the compound and swiveling the compound about until the proper degree mark on the rest coincides with the zero gradation on the base. The clamping screw is then tightened again.

The tool is set exactly on center—as it should be in all form turning—and the hand feed on the compound is used to feed the tool across the work. Considerations of speed and feed should be taken into account in determining how many passes of the tool will be necessary.

The piece can be turned almost to size with a roughing tool and brought to final size with a finishing tool. The angle of taper can be checked with a bevel gage or a machinist's protractor.

Longer tapers may be turned by the set-over tailstock method or by the use of a taper attachment. When the lathe centers are not in line, the piece turned will be smaller at the end having its center nearest the cutting tool. Therefore, to turn a taper it is only necessary to set the tailstock over far enough in the right direction.

The amount of set-over can be calculated easily. Since for each inch of taper the tool must advance into the work half the reduction in diameter, the total offset can be computed from the formula:

$$\text{offset} = \frac{\text{tapers per inch} \times \text{length in inches.}}{2}$$

Thus for a four-inch section tapering ¼ in. per in., the tailstock would be set over $\frac{¼ \times 4}{2}$ or ½ in.

Several methods can be used to measure the set-over. When it is not over one inch, it can usually be read directly on a scale mounted on the base at the rear of the tailstock. Where this is not possible, the tailstock may be pushed up to the headstock and the offset measured with a rule. The compound rest may also be used. The lathe centers being aligned, the tool rest is moved up until it bears on the tailstock spindle. The graduated dial on the cross slide is set at zero and the tool rest is backed out the required distance. The tailstock is then set over until its spindle once more bears on the tool rest.

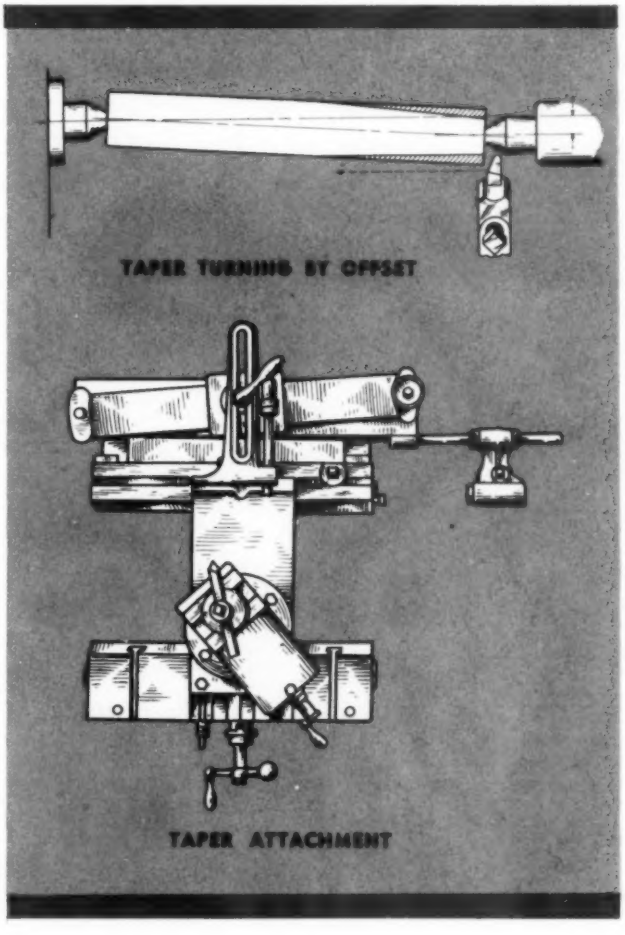
The piece is turned just as if the job were set up for straight turning, roughing cuts and finishing cuts being taken in the same way. Care must be taken in measuring diameters, however, to make sure that the points of the caliper or micrometer bear exactly at the position desired.

Though the offset-tailstock method can be used on any lathe, it has certain drawbacks. Since the lathe centers are not in line, the center holes tend to be distorted and the work to run out of true. If the lathe is being used for a variety of jobs, the centers must be realigned frequently. Because the centers project into the work an indefinite distance, it is impossible to set the amount of offset exactly. And lastly, because the work must be held on centers, it is impossible to cut internal tapers by this method.

To overcome these difficulties, taper attachments have been developed to fit most engine lathes. These consist of some means of feeding the tool into the work as the carriage moves along the ways. Usually a guide which can be set at the required angle of taper is fastened to the back of the machine bed, and a connection is provided between the guide and the cross slide. When the binder screws of the cross slide are loosened, it can be moved in and out by the connecting arm.

The taper guide may be set by means of a built-in scale which reads directly in taper per foot. Because of this, neither the length nor diameter of the work need be taken into account.

The work may be held in the lathe by whatever means is most convenient since all the tapering action is supplied by the attachment. Once the guide is set and all backlash has been taken out of the connection, the tapering is performed like any other turning or boring operation.



Drilling and Reaming

Several lathe operations are performed with the tool mounted in the tailstock spindle. Among these are drilling, reaming, tapping and thread cutting with dies.

DRILLING is done in the lathe with the same style twist drills that are used in a drill press. In the lathe, however, the work rather than the tool turns. Small straight shank drills are held in a drill chuck having a tapered shank which fits the taper in the tailstock spindle. Larger tapered shank drills may be held directly in the tailstock spindle or in an adapter. Where large drills are held in the tailstock, it is wise to place a dog on the shank end to assure that the drill will not turn in the spindle.

The piece is held in a chuck, if it is short, or in a chuck and steady rest, if it projects very far from the chuck. It should be running true and be faced square before any drilling is attempted.

Starting the drill is the first problem. A center drill may be used to start the hole or a small conical indentation may be turned at the center of the face. The tailstock is then moved up until the drill almost touches the work. It is then clamped on the ways. The drill is fed to the work with the tailstock handwheel. If the drill wobbles as it starts to cut, the butt end of a toolholder held in the toolpost may be brought to bear near the point to hold it steady.

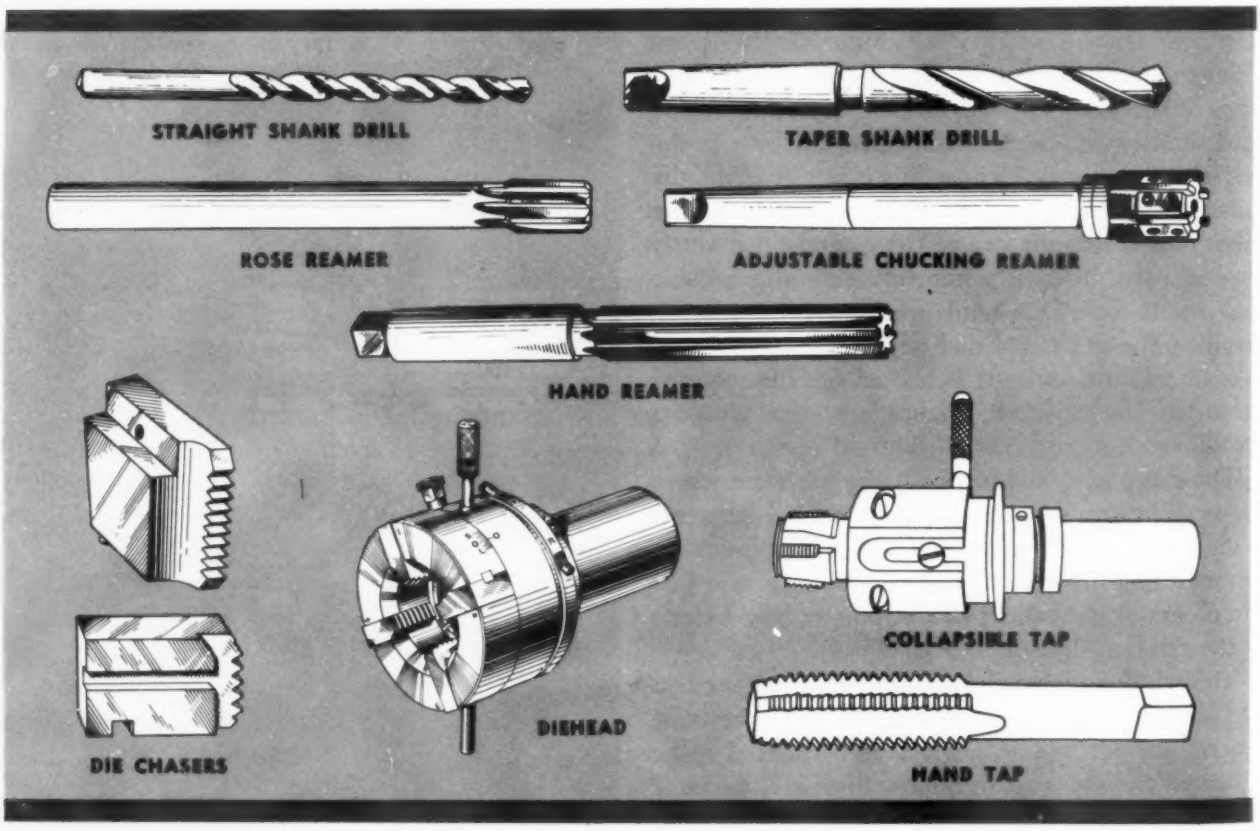
The depth to which the hole should be drilled can be read from a scale marked on the tailsock spindle. If the zero graduation aligns with the nose of the tailstock body when the cut is begun, the depth is given directly. Otherwise, the original extended portion must be subtracted from the total extension to give the depth. When a deep hole is being drilled, the entire tailstock should be advanced from time to time to prevent the spindle being fed beyond the feed screw.

When large holes are to be drilled, it is best to drill a small pilot hole through the entire depth. This will prevent the large drill from running out. When the hole to be drilled is fairly deep, the drill should be backed out of the hole at frequent intervals to clear the chips.

Some drilling may be done with the drill held in the live spindle and the work supported by a special tailstock center. Except for center drilling, however, this is a makeshift practice.

REAMING is a process for finishing holes to exact size and surface condition. It is performed by running a tool having long cutting edges on its circumference through the drilled or bored hole.

Since it is not safe to drill holes where the tolerance is less than 0.003 or 0.004 in., holes are usually drilled 1/16 in. or more undersize, bored within



0.002 in. of size, and finish reamed. The reaming may be either by hand or by machine. Hand reaming is more exact but machine reaming is quicker if a number of holes are to be reamed in succession. Where considerable stock must be removed, a rose reamer is used. Finer finish requires the use of a fluted chucking reamer.

Reamers are held in the tailstock in the same manner as drills; small ones being held in a chuck, larger ones in the tapered spindle. Reaming is done with a high feed and slow speed, i.e., the tool is advanced rapidly into the piece but the spindle speed is reduced to about half the speed required for drilling.

Tapping and Threading

TAPPING is a method of forming internal threads. The ordinary hand tap consists of a cylindrical threaded cutting section, in which three or four flutes are ground, and a shank as small or smaller than the minor diameter of the thread. The shank end is milled square to take the top wrench.

This may be used in two ways in the lathe. The shank end may be supported by the tailstock center to hold it in line while the tap is fed into the work by hand with a tap wrench. The drive spindle is locked so that it will not move during the tapping operation.

The thread may also be cut by power if the lathe is run very slowly and is stopped immediately when the tap has cut to the required depth. There is some danger of tap breakage with this method so it should be used judiciously. Whichever method is used, the tap should be backed out of the work by hand.

For high-production machine tapping in the lathe, the tap may be held in a special floating holder which releases the tap when it has cut to full depth so that it revolves freely with the work until the spindle is reversed for backing out. A still faster and safer method is to use a collapsible tap. In this type, the cutting edges can be withdrawn into the body of the tap so that the tap can be removed from the hole without reversing the spindle.

Tapped threads are not as accurate as those cut with a single-point threading tool but they can be cut much quicker and are accurate enough for all but precision work. Most internal threading is done by tapping.

DIE-CUT THREADS are much more rapidly formed than turned threads. For this reason they are much commoner, even though they are not quite so accurate. They are cut by die chasers, high-speed steel tools formed in the size and shape of the desired thread. These are made in various styles of which the illustrated are among the most common.

For machine work, die chasers are held in self-opening dieheads. These heads are made so that the cutting teeth may be withdrawn when the screw has been cut to its desired length.

Since the threaded work must pass through the shank of the diehead, the length of thread is limited by the diehead size. As a rule, die-cut threads are limited in length to two or three times the diameter of the work.

KNURLING is a method of creating a rough gripping surface on the circumference of the work. This is done with a special knurling tool which is made in several patented styles. In general, two rolls having diagonal cutting teeth are forced into the work so that they form a diamond-shaped pattern on the work. Another type cuts a straightline pattern. Either type can be had in a coarse, medium or fine pitch.

The knurling tool is set in the toolpost so that the knurls are the same distance above and below the center line of the work and parallel to it. Make sure both knurls are in contact with the work.

The knurled section should be cut at medium speed and feed. When the lathe is started, the knurling tool is forced into the work and the longitudinal feed is engaged. The full length should be cut without stopping the carriage, otherwise rings will be left in the knurled surface.

FILING AND POLISHING are sometimes performed on lathe work in order to get a fine finish or to reduce a diameter slightly. It is difficult to produce a true cylinder by filing so, other factors being equal, some other method of finishing should usually be adopted.

The file used on lathework is a single cut, smooth mill file. The handle is held in one hand and the tip between the thumb and forefinger of the other. Strokes are taken at a slight angle to the work with a pressure somewhat lighter than for bench filing. The file is moved along the work with overlapping strokes until the entire surface has been covered.

Polishing is done with a piece of abrasive cloth stretched along the file or placed over the work and held with the thumb and forefinger. The finer the grade of abrasive, the slower the cut and the higher the finish. A finer finish can be obtained by placing a drop or two of oil on the abrasive cloth.

Both filing and polishing should be done at higher speeds than turning. On small work the lathe should be run at top speed. The ways of the machine should be covered with paper or cloth during filing and polishing as protection against the powdered abrasive and fine chips.

Speeds and Feeds

To perform your job most efficiently, your lathe should be run at the highest speed and coarsest feed which will give the desired final result. To know how to determine the best speeds and feeds is part of the knowledge that comes with experience, but there are some guides which you can use in obtaining this knowledge.

Shop men working with the various materials have found certain average speeds for these materials. Further experience is constantly revising them, but the speeds given in the accompanying table will give you starting values which you can adapt to fit your job.

Cutting speeds are usually given in surface feet per minute, that is, the number of feet of surface that pass the cutting tool in one minute. A small diameter must turn much faster than a large one to cover an equal number of feet per second. The approximate number of revolutions per minute necessary to give a certain speed for a certain diameter may be found by multiplying the cutting speed by 4 and dividing it by the diameter of the work.

The experienced lathe hand determines his cutting speeds and feeds from the way the machine runs, from the color of the chip and the feel of the machine. Steel chips should come from the machine a light straw color. If they are blue, the work is running too hot and the feed or speed, or both, should be reduced. If the chip is not discolored at all, one or the other of the factors can be increased.

If the machine labors or vibrates, it is overloaded. The feed should be reduced. If the machine is cutting easily, it may be possible to increase the feed.

The condition of the tool gives still other indications. If the edge breaks down too rapidly or builds up excessively, it will be necessary to reduce the speed or the feed.

Cutting Fluids

Because a great deal of heat is developed in any machining operation, it is usually necessary to pour some sort of cooling solution over the tool and the work. Otherwise, the work may be distorted and the edge of the tool spoiled. While cooling the tool and work, a good cutting fluid will also prevent undue friction, improve the finish of the work, wash away chips and permit faster cutting speeds.

Mixtures of soluble oil and water make good coolants for most materials. Animal and mineral lard oils, either straight or compounded with kerosene, are also good for general work. Extremely hard or tough materials usually require oils having a sulphur or chlorinated base.

The best cutting fluid for each particular job is often selected by the production engineer; however, if your job instructions do not contain this information, your foreman will tell you what to use. The chief precautions in the use of cutting fluids concern cast iron and magnesium. Wet cast-iron chips form a paste which clogs the coolant system and creates an abrasive action between the tool and the work. Because magnesium chips and water make an inflammable mixture, only straight cutting oils should be used on it.

TABLE OF CUTTING SPEEDS

Material	Surface Speed — Feet Per Minute				Feed — Inches Per Revolution
	High Speed Steel		Carbide		
	Rough	Finish	Rough	Finish	
Cast Iron	50-60	70-80	185-225	300-375	0.016-0.025
Semi Steel (Hard)	40-50	60-80	185-225	300-375	0.016-0.025
Malleable Iron	60-80	80-90	185-225	300-375	0.016-0.025
Steel Casting	40-50	60-80			0.010-0.020
Brass (Commercial)	150-180	190-210	400-600	400-600	Maximum
Bronze	90-100	100-110	300-400	400-600	0.016-0.030
Aluminum	200-300	300-400	Highest	Possible	Fine Feeds
SAE Steels					
1020 (Coarse Feed)	50-60	50-60	185-225	300-350	0.020-0.030
1020 (Fine Feed)	60-80	60-80	185-225	300-350	0.007-0.020
1035	60-70	70-80	185-225	300-350	0.020-0.030
X-1315	90-100	100-110	300-350	300-350	0.010-0.015
1050	50-60	70-80	185-225	300-350	0.012-0.020
2315	70-80	70-80	200-225	300-350	0.012-0.020
3150	40-50	50-60	185-200	250-300	0.012-0.020
Stainless Steel	60-80	60-80			0.010-0.015

Three articles have already appeared in the "Tools of Our Trade" series. The first, which gave its name to the series, was a picture dictionary of machine shop tools. The second and third, "How to Run a Drilling Machine" and "How to Run a Milling Machine", introduced the new employee to these machines. One more section, on grinding machines, is planned for early issue. Reprints of all the sections are available from the Editor, AMERICAN MACHINIST, 330 West 42nd St., New York, N. Y., at 10 cents a copy (less in lots of over 500).

The preparation of this section would have been impossible without the cooperation of a great number of American lathe manufacturers, and we are duly grateful to them for the information and illustrative material which they have supplied.

AMERICAN MACHINIST REFERENCE BOOK SHEET

Tolerances for Worms and Worm Gears—III

A standard practice adopted by the American Gear Manufacturers Association, and known as "Inspection and Tolerances for Gears—Part II"

2. *Pitch* Error

Pitch error of a worm is the maximum difference between any two successive tooth-to-tooth readings in an axial plane between corresponding sides of adjacent teeth. It refers particularly to multiple-thread worms because it indicates the spacing error between successive threads.

Tooth-to-tooth readings of a single-thread worm are not ordinarily measured because the same error is more readily observed in the lead check. On multiple-thread worms, the readings are usually made by successively indexing the worms by means of a master index plate, using a finger to actuate a dial indicator. Both the indicator and finger are mounted on a movable block or slide that has some means to return it always to the same position. The indicator is set at zero or some arbitrary reading for the first pair of threads, and all readings between successive pairs of threads are relative to the first reading. In interpreting the readings, it is important to note that the readings are not errors; it is the *differences* between successive pairs of readings that denote pitch variations or differences between individual readings and the average reading.

In checking pitch errors of multiple-thread worms, an axial plane has been selected as the plane of measurement. Readings may be taken directly in this plane if the lead angle is low, but at higher angles it is preferable to set the indicator and finger to read in a plane normal to the threads, and to convert the readings to an axial plane for purposes of comparison and standardization by dividing by the cosine of the lead angle.

Another method involves the use of master gage blocks to measure directly from one tooth to another in an axial plane.

Pitch error of a worm gear is the maximum difference between any two successive tooth-to-tooth readings taken in the plane of rotation at the pitch circle between corresponding sides of adjacent teeth.

Tooth-to-tooth readings of a worm gear may be taken by a pair of fingers, one fixed and the other actuating a dial indicator, both of which are mounted on a movable block or slide that is returnable always to the same position. A spring-tension device is desirable to keep a definite uniform tension of gear against the fixed finger. The indicator is set at zero or some arbitrary reading for the first pair of teeth, and all readings between successive pairs of teeth are relative to the first reading. The *differences* between successive pairs of readings denote pitch variation.

A plane of rotation has been selected as the plane of measurement for worm gears. In the case of worm gears mating with worms having low lead angles, the tooth-to-tooth readings may be readily taken in the plane of rotation. But at higher thread angles the indicator finger may give false readings from the side cramping effect of the angular teeth. In such cases, preliminary readings may be taken in a plane normal to the teeth at or near the pitch circle, and converted to the plane of rotation for purposes of comparison and standardization by dividing by the cosine of the lead angle of the worm.

Either set of profiles may be used for tooth-to-tooth readings of worms or worm gears, but preferably the driving sides if the set operates in one direction only. It is ordinarily unnecessary to take tooth-to-tooth readings on both sets of profiles, provided both sides of the teeth were finished with the same set-up.

The pitch-error readings of worms or worm gears may or may not be influenced by the runout, depending upon whether the stop on the indicator slides operates against a stop external to the gear or against the bottom lands of the teeth, or the outside diameter if a topping cutter has been used. It is preferable to have pitch-error readings independent of runout, because runout is mainly a function of blank processing and setup and can be readily determined separately, whereas pitch errors are mainly a function of the gear cutting machine or cutter. On gears with high numbers of teeth, the runout effect on tooth-to-tooth readings is so gradual that it may be ignored, unless the readings are used subsequently as a basis for deriving accumulated error.

In establishing tolerances for the precision and commercial high-speed classes, it has been assumed that the hob threads are hunting with respect to the teeth in the worm-gear; or if non-hunting, that successive cuts are made after indexing the hob the required number of times to insure all of the active cutting teeth acting upon all the teeth in the worm gear.

3. *Profile Error*

Profile error of a worm tooth is the difference between the highest and lowest readings of a dial indicator moving along a path representing the desired tooth form. It may be measured in an axial or normal plane depending upon the basic tooth form selected.

A considerable departure in form may be acceptable on a worm, provided a corresponding departure is present on the mating worm gear, as indicated by the area of initial tooth contact. Frequently, the form of the worm or the worm gear hob teeth are intentionally modified with respect to each other to concentrate the tooth contact away from the top and bottom of the teeth. This should be given consideration in applying the profile tolerances, because obviously if there is a satisfactory contact between a worm and gear the profile error may be ignored.

Profile error is substantially independent of worm diameter.

4, 5. *Lead Error*

Lead error of a worm is expressed either as the total variation in lead for one convolution, or in the total length of the worm. In the latter case it is assumed that the worm is a reasonable amount longer than the minimum necessary to attain proper length of contact, in accordance with good design.

It may be measured by traversing an indicator along a tooth parallel to the axis while the worm rotates in a timed relation according to the specified lead. When the indicator is set in a direction normal to the helix to avoid the side cramping effect that might otherwise occur, the readings are converted to the axial direction by dividing by the cosine of the lead-angle.

Lead error is substantially independent of worm diameter.

A considerable error in lead may be acceptable provided a similar error is present in the hob for producing the mating worm gear. This should be given consideration in applying the lead tolerances.

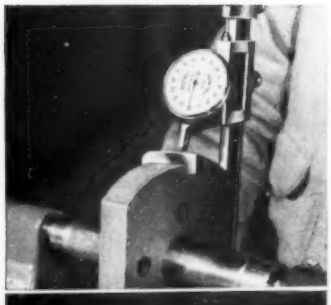
STARRETT TOOLS

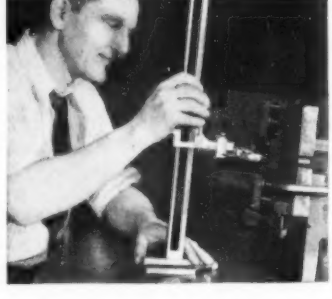
STARRETT TOOLS

Helping to Give the AIRACOBRA *Its Sting!*

These scenes in the plant of the Bell Aircraft Corporation give some idea of the wide range of precision measuring and inspecting work being performed by eager hands with the sureness and swiftness that tools of Starrett quality and workmanship contribute to the job.

You may be certain that the makers and distributors of Starrett Tools will keep on doing their utmost to provide the tools needed to finish the job.





THE L. S. STARRETT CO.

World's Greatest Toolmakers

ATHOL, MASSACHUSETTS, U. S. A.

STARRETT

PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

Tolerances for Worms and Worm Gears—IV

6. *Accumulated Error*

Accumulated error of a worm gear is the maximum accumulation of pitch errors obtained by algebraic addition of tooth-to-tooth pitch errors.

In deriving the accumulated error, the tooth-to-tooth pitch errors must be corrected with reference to the true pitch. The method is the same as explained in "Tolerances for Spur and Helical Gears" and published previously.

Unless otherwise specified, accumulated error is checked over the entire 360 deg., and expressed as the maximum error between any two teeth. In some cases it is measured only for one-half or one-third of a circle, and occasionally tolerances are set for accumulation over any three or four adjacent teeth.

Accumulated error of a worm gear may also be obtained by comparing tooth spacing with divisions on a master graduated plate or circular table.

Accumulated error may or may not include the effect of runout or wobble, depending upon how it was derived. In setting the tolerances it was assumed that it does not include the effect of runout or wobble.

For low- and medium-speed worm gears, accumulated error is of minor importance unless the sets are to be used for timing mechanisms, dividing gears, gun-sighting devices, or the like. Even on high-speed gears, it is secondary in importance to pitch error, profile error or initial area of contact.

Accumulated error may be derived for any gear for which tooth-to-tooth readings are available, although it is a rather tedious check to make on large gears. As a matter of fact, an occasional check to see that the gear cutting machine is cutting within the desired accumulated-error tolerance is usually all that is necessary.

7. *Required Initial Area of Contact*

The initial area of contact between a worm and worm gear is determined by operating the set at proper center distance, and side and angular relations, under average operating loads for a short time, then observing the contact on all the worm gear teeth. If means are not available for operating a worm and worm gear under load, the contact area must be judged by hand testing. In either case, the percentage of contact is a matter of judgment by eye, because precise methods of measuring such areas are not available.

If the set is to operate in one direction only, then the contact need be checked only on the one set of profiles.

It is essential that the contact be centered approximately at the midplane of the worm gear, and likewise that it be fairly uniform from top to bottom of the teeth without hard streaks at either top or bottom, and that it be substantially the same on all teeth.

The percentage of required minimum initial area of contact as listed may not apply in some cases. For instance, if the load on the set fluctuates widely, a more restricted initial area of contact may be desirable to allow for the varying deflection that occurs.

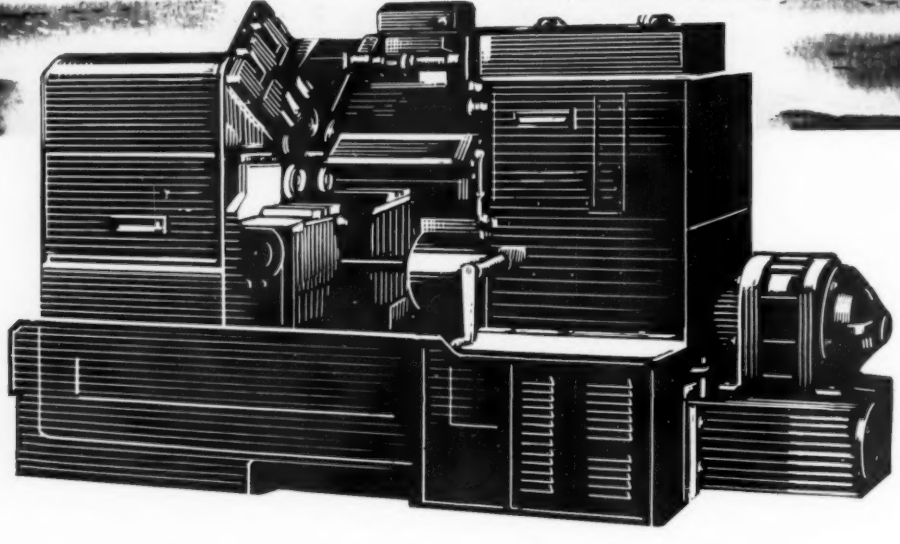
This test is the most critical in worm gear testing.

WORM GEAR INSPECTION TOLERANCES*

CLASS	C. P. Inches	Runout of P. D., Total Indicator Reading								Pitch Error Measured on Pitch Circle in Plane of Rotation								Accumulated Error Between Any 2 Teeth Exclusive of Runout Effect								Required Minimum Initial Area of Contact, Per Cent
P. D.		¾	1½	3	6	12	25	50	100	¾	1½	3	6	12	25	50	100	¾	1½	3	6	12	25	50	100	
Precision	1	..	..	..	10	10	12	14	16	..	..	..	5	5	5	6	6	..	..	..	10	10	12	20	30	
High-Speed	½	..	..	10	10	10	12	14	16	..	..	4	4	4	5	5	5	..	..	10	10	10	12	20	30	
Over 1,000	¼	..	10	10	10	10	12	..	..	..	2½	3	3	3	4	..	..	..	10	10	10	10	12	20	30	50
Ft. per Min.	⅛	10	10	10	..	..	..	..	..	2½	2½	3	..	..	..	..	..	10	10	10	..	..	..	..	..	
Worm Speed																										
Commercial	2	..	..	..	..	20	25	..	..	..	..	..	..	9	9	..	..	..	..	..	..	20	27	..	..	
High-Speed	1	..	..	..	20	20	25	25	30	..	..	..	7	7	7	8	8	..	..	..	15	15	15	35	55	
Up to 1,000	½	..	..	10	15	20	25	25	30	..	..	6	6	6	6	7	7	..	..	15	15	15	15	30	45	40
Ft. per Min.	¼	..	10	10	15	20	25	..	..	..	3½	4	4	4	4	..	..	..	15	15	15	15	15	..	..	
Worm Speed	⅛	10	10	10	..	..	..	..	..	3	3	3½	..	..	..	..	..	15	15	15	..	..	..	..	..	
Commercial	2	..	..	..	..	25	30	35	40	..	..	..	..	15	20	25	30									
Medium-	1	..	..	..	20	25	30	35	40	..	..	..	10	12	12	15	20									
Speed Up to	½	..	..	20	20	25	30	35	..	..	..	8	8	10	10	12	..									30
200	¼	..	15	20	20	25	30	..	..	..	7	7	7	8	8	..	..									
Ft. per Min.	⅛	15	15	20	..	..	..	..	..	5	5	6	..	..	..	..	..									
Worm Speed																										
Low-Speed	4	..	..	..	..	..	90	90	100	..	..	..	..	..	60	70	80									
	2	..	..	..	..	60	80	80	90	..	..	..	..	35	40	50	60									
	1	..	..	..	60	60	80	80	90	..	..	..	30	35	35	40	50									20
Up to 40	½	..	..	50	60	60	80	80	..	..	..	25	25	30	30	35	..									
Ft. per Min.	¼	..	30	50	60	60	80	..	..	..	20	20	20	25	25	..	..									
Worm Speed	⅛	30	30	50	..	..	..	..	..	15	15	20	..	..	..	..	..									

* All readings in ten-thousandths of an inch.

Bulwarks



● Just as the Rock of Gibraltar is a Bulwark of Defense . . .
So are New Britain Automatics the Bulwark of Industrial Production.

ARMY NAVY

NEW BRITAIN AUTOMATICS

NEW BRITAIN-GRIDLEY • MACHINE DIVISION
THE NEW BRITAIN MACHINE CO. • NEW BRITAIN, CONN.

It's Time Once More To Sell

FOR MANY MONTHS metal-working manufacturers have enjoyed that rare phenomenon known as a seller's market.

Instead of the manufacturer beating a path to the door of his customer, the customer has come to the manufacturer. And the customer has been Uncle Sam.

To say that Uncle Sam has been a good spender is an understatement. He has been a prodigal spender, lavishly awarding contracts totaling billions of dollars for war purposes.

All that the manufacturer had to do was to go and get his share. He often didn't have to exert that much effort. It was dumped into his lap without his asking for it.

This extraordinary situation has not been all on the plus side. It has tended to lull him into a feeling of smugness. In some cases it may have made him think that the millenium had arrived —the day when his sales department could be abolished.

If he has let himself get into that dangerous state of mind, the sooner he snaps out of it, the better. For the time is already upon him, or is close at hand, when good old-fashioned selling must again be part of the equipment of every manufacturer.

War orders are no longer like ripe plums ready to drop into the basket. Some industries have passed the peak war demand for their goods and must turn to other sources for business. They cannot sit at their desks and watch the orders flow in by mail and by phone as they once did. They aren't summoned to Washington, as they were formerly, to have a ten million dollar order given them.

For plenty of manufacturers the problem right now is one of conversion from one war product to another. In solving that problem, they should not make the error of believing that Uncle Sam is still doling out the orders to all comers.

If they expect to keep their facilities occupied, they must go out on their own and drum up business. They must use the same ingenuity and enterprise and persistence that they did in peacetime.

They must analyze their own capacities and capabilities and set out to get work to fit them. They must investigate opportunities for prime contracts and for subcontracts. They must not let pride stand in the way of going after overflow work from companies which in normal times are their competitors.

Quality of work, delivery dates, management "know-how," price, adaptability of present equipment to do a job—all of these factors and many others will be weapons to use in capturing orders.

The manufacturer who does a good selling job will get the business. The company that sits and waits for orders to come its way will wait a long time with discouraging results. To a marked extent, success or failure will depend upon individual enterprise.

It is time for manufacturers to disprove the belief among some government officials that industry has had so much business shoved at it the last few years that it has forgotten how to sell.

Burnham Finney

GAGING BUSINESS

Allied sea and land victories signal need of greater production. Ship building steps up, increasing demand for war goods to fill new bottoms. Expect to up steel output a million tons in third quarter. Tool situation mixed

Good News Cuts Production War production officials are laboring valiantly to get still higher output from American factories. One reason is that a noticeable letdown occurred after the North African victories. Another reason, which is particularly significant, is that recent spectacular anti-submarine successes are opening the way for much larger shipments of munitions than ever before.

It is believed that the improvement in anti-submarine warfare will make desirable the greatest munitions production efforts that the country has ever seen. WPB officials are getting under way plans to impress upon management and labor the important effect upon shortening the war of a quick pick-up in output of all types of war goods as a result of winning the fight against the U-boats.

More Ships; More Demand Gains of well over 1,000,000 tons net of shipping in June are estimated to have been made. The total increase may beat that figure by as much as 40 percent. Confidence rules that the recent gains will be sustained in the months ahead. Practically unmolested passage through the Mediterranean in the near future is considered likely. The additional shipping thus made available will further emphasize the need to turn out the maximum quantities of every item going to the armed forces and for lend-lease deliveries.

The ability to ship greatly increased quantities of war goods is expected quickly to eliminate questions that were coming up on the probable necessity for curtailing some lines of production because of anticipated piling up of deliveries in this country.

Few new plants for war production are being approved. The number will be still fewer from now on. It still is thought in high circles that the full capacity of existing facilities is not being used. Many new plants have been completed and put into operation in recent months.

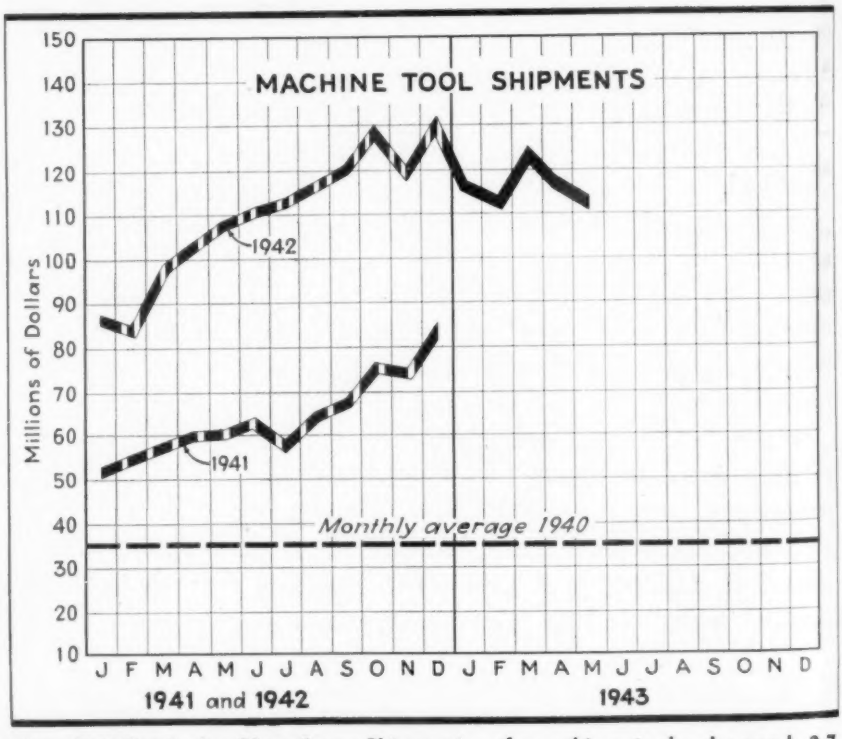
Hope for Goal Despite Strikes The steel situation is continuing to cause alarm, especially since raw steel production was pared as a result of coal mine closings. Despite the handicaps facing ths steel industry, it is believed that the goal will be attained of securing 1,000,000 more tons in the third quarter than originally had been anticipated. Plate tonnage is staying at a high level, enabling shipyards to get much-needed materials on time.

There is a mixed condition in nonferrous materials. Copper mining is a critical spot with the manpower shortage getting steadily worse. Mexicans, incidentally, are being brought in to relieve this situation. The magnesium supply is relatively easy. There is plenty of pig aluminum. It is expected that the tight positions in aluminum extrusions and forgings will be more comfortable within 90 days.

Some Backlogs Are Being Cut There is considerable disparity in the current positions of machine tool manufacturers. Some, especially those building standard machines, report greatly reduced backlogs as shipments catch up with new orders. Makers of special single-purpose machines are extremely busy and are booked as far ahead as nine to ten months. Pool orders are being continued, but on a stricter basis. Manufacturers must show actual orders in hand before they are allotted pool orders. Progress is being made in connection with the plan for setting up a chain of warehouses around the country to store machine tools turned out by the industry but not yet claimed by government agencies.

An increasing percentage of machine tool builders are getting into production of war goods other than machine tools. The rapidity of this development depends upon the needs of the individual manufacturer and his aggressiveness in seeking out work adaptable to his factory facilities and equipment.

Tool Orders One-Third Production Fresh orders for machine tools, running from one-third to one-half the volume of production, are principally from two sources: the airplane industry and Lend-lease. Russian buying in particular has been heavy. In some machine tool building centers production is being adversely affected by the calling up of workers by the armed services. Labor has become so scarce that many of these men cannot be replaced and hence output will suffer.



The Cut-Back is Showing—Shipments of machine tools dropped 3.7 percent from $118,024,000 in April to $113,710,000 in May, while orders declined 16.1 percent from $57,331,000 to $48,091,000. On the basis of this, the War Production Board assumes that the cut-back may be beginning to take effect

War Agencies Get Ten Percent Back by Renegotiation

Producers seek to retain reconversion reserves, or to have renegotiation applied after taking of excess profits tax. Procurement agencies favor present plan

BY ROBERT COLBORN

WASHINGTON—Renegotiation of war goods contracts is resulting in returns and price reductions of slightly over ten percent of the principal, according to facts presented during the hearings of the House Naval Affairs Investigating Committee. Refunds on paid-up contracts have netted Army, Navy and Maritime Commission $1,141,259,777, while price reductions on yet-to-be-completed contracts aggregate $2,123,851,964.

The total, $3,265,111,741, represents renegotiation of 2,165 past and present contracts with an overall value $30,935,000, or slightly better than a ten percent return. One must remember, however, that over $24,000,000 of that amount would be returned to the government as taxes anyway.

Volume Cut Cost

Many contractors, especially those making war products differing from their peacetime products, say that their original prices were based on insufficient cost knowledge, and that greatly increased volume has made possible lower operating costs and higher profits.

Representing the Aluminum Company of America, George R. Gibbons, vice president, endorsed before the committee the principle of contract renegotiation, but urged that financial consideration be given under the present law to the postwar readjustment period facing war industries.

Want Taxes First

In the discussions between contractors and negotiators and at the committee hearings, the postwar reserve for reconversion and the lean period has been much talked of. Manufacturers ask that the renegotiation boards look toward adjustment after taxes have been deducted. But the boards of the procurement agencies favor renegotiation before the application of taxes.

Francis A. Callery, vice president of Consolidated-Vultee Aircraft Corporation, representing the opinion of six West Coast aircraft companies urged that three revisions in the law be made: To provide for renegotiation only after taxes are paid; that reserves be provided for the postwar transition from wartime economy; and that the provision for a termination of contracts give more adequate protection to contractors.

Commission Opposes Change

Contrariwise, Lieut. Comdr. Arthur G. Rydstrom, member of the price adjustment board of the Maritime Commission said his group opposed any change in the present law, providing for renegotiation after payment of taxes, "because it would interfere with our price fixing job and future pricing policy." As for an amendment to the act guaranteeing postwar reserves to manufacturers for reconversion to peacetime production, he said the Maritime Commission board "feels the need is not as apparent as for companies renegotiating under War and Navy price adjustment boards."

Favor Tax Alone

Arguments have been presented that the excess profits tax, alone, is all that should be deducted. These proponents further urge, that, if this tax is not sufficient, its rates should be raised and renegotiation eliminated.

Some manufacturers advocate the establishment of a minimum profit base under which they wouldn't be taxed or renegotiated.

But the present excess profits tax is looked upon by officials as not covering all angles, in that renegotiation is for the purpose of price adjustment to keep the cost of the war as low as possible.

Manufacturers of standard commercial products, appearing before the House Naval Affairs Investigating Committee, have argued that the Office of Price Administration should be sufficient to determine proper government payments for their goods; legislative quarters look upon this as an unsound argument, since OPA ceilings allow leeway for the inefficient, high cost producer.

Hope for Tool Builders

The findings of this sub-committee will affect the recommendations to be made to the Ways and Means Committee. It is thought that machine tool builders may well get consideration of their peculiar status.

Automobile people, used to annual conversions and with a hungry market awaiting their return to the pleasure car field, have raised little if any objection to renegotiation and say they have enough reserve.

F. Donaldson Brown, vice president of General Motors, told the committee that his firm "has no cause to complain about renegotiation." He at the same time urged the adoption of a policy "of extending positive encouragement to efficiency through suitable reward for accomplishment."

Concerning the arguments of machine tool people that they should be allowed to keep their surplus to tide them over the years required to eat away their present enormous output, it has been stated that if such were allowed some safeguards would necessarily be established to assure proper use of funds.

In most quarters the claims of the machine tool builders to special treat-

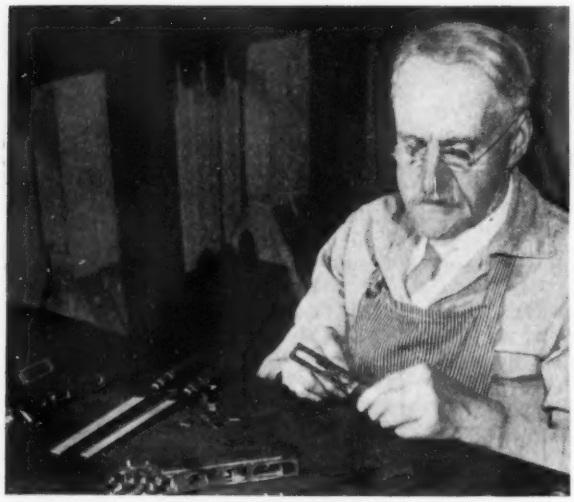
LESS NEED CLOSES WORKS

NIAGARA FALLS, N. Y.—Production at the Lake Ontario Ordnance Works, in operation 18 months, will be halted July 31 because there is no longer need for the plant's products, Lt. Col. Stanley C. Shubart, commanding officer of the works, has announced.

He said closing of the plant was due to changing requirements of war.

The Renegotiation Picture

	Navy	*Army*	*Maritime Commission*
Companies assigned for renegotiation..	2,800	1,000	9,743
Having contracts totaling	$30,000,000,000		
Total contracts renegotiated.....	$11,900,000,000	$535,000,000	$18,500,000,000
Agreement completed	423	84	1,658
Still in process	2,894		4,076
Excess profits recovered	$ 399,009,777	$ 44,250,000	$ 698,000,000
Price reductions, future deliveries.....	$ 612,651,964	$ 43,200,000	$ 1,168,000,000
Voluntary price reductions.....	$ 300,000,000	(included in the above)	
TOTAL REGAINED	$ 1,311,661,741	$ 87,450,000	$ 1,866,000,000



Into Harness Again — Back from retirement, Archibald J. Griffith, 76, is doing his daily stint at Brown & Sharpe Manufacturing Co. to help war production. The oldest employe in the plant, both in age and years of service, his re-employment is the result of the company's extensive drive to meet war production demands

ment have received consideration. However, a member of the price adjustment board of one agency was asked whether any special allowance is being made for those companies which are now busily consuming their future market, as are the machine tool builders, in comparison with those hoarding their markets, as automobile manufacturers. He replied: It is not within our power, nor within the province of the act under which we carry on these renegotiations, to allow an extra margin of profit for reconversion reserves; "we're procuring for war," and we "can't be concerned with reconversion reserves. It's up to us to do this job as cheaply as possible."

The same renegotiator pointed out that most contractors didn't seem to have an exact idea of the reserve needed; they just want all they can get. Admittedly, many beside machine tool builders will need reserves for the period of low business after the war, as well as for reconversion.

Canadians Like Priority Plan; Joint Truck Manufacture Booms

OTTAWA—War and consumer goods plants in Canada are well satisfied with a new priorities plan now in operation which frees them finally from the necessity of compliance with Washington's unstable priority system over all of their ordering of Canadian supplies and much of their ordering of U. S. supplies. Canada's new Program Classification System greatly simplifies priority procedure. Washington accepts Ottawa's certification that the goods procured from the United States are to be used for essential purposes. Canadian distributors of materials of U. S. origin required in Canada as maintenance, repair and operating supplies are provided with a simplified system of identification which enables them to apply U. S. preference ratings to their orders.

Has Code Numbers

The all-Canadian Program Classification System operates with 24 PCS code numbers identifying use for which materials are required as follows:

1, aircraft; 2, cargo vessels; 3, naval vessels; 4, tanks and army combat vehicles; 5, mechanical transport vehicles; 6, ammunition; 7, armament and weapons; 8, army and airforce equipment and supplies; 9, navy equipment and supplies; 10, construction for armed services; 11, construction for new manufacturing plants; 12, housing construction; 13, all other construction; 14, rail transportation; 15, all other transportation; 16, power, light and heat, communications and other utilities; 17, petroleum; 18, industrial machinery and equipment; 19, agriculture; 20, food processing machinery and equipment; 21, 22, 23, maintenance, repair and operating supplies as classified in schedules; 24, civilian equipment and supplies.

The new system gives effect to the contention of Canadian priority control officers, maintained ever since priorities were established by Washington, that an elastic system of allocations would give better results in Canada than the highly formalized systems which Washington has sought to apply in rapidly changing versions. In the past Ottawa has been obliged to comply with every change in the U. S. system. The plan now in operation in the Dominion is expected to continue indefinitely. It saves war contractors and other users a lot of paper work.

Half-Millionth Truck Made

Workers from Canadian plants of General Motors, Ford, and Chrysler collaborated in construction of the 500,000th mechanical war transport unit to come from Canadian assembly lines since the start of the war. Joint production of the unit symbolized the manner in which the automotive companies have pooled resources in the war effort. More than a hundred types of motorized military transport equipment are being made in the dominion at the rate of approximately 450 combat vehicles and 4,000 transport type vehicles a week.

Canada Supplies Russia

Large quantities of Canadian-made war equipment will be supplied to Russia in the next few months under Canada's new billion dollar mutual aid program for the direct supply of help to the United Nations without the imposition of obligations on the recipient countries. In the fiscal year ended March 31 this country sent about $100,000,000 of war equipment to Russia. In the current fiscal year the volume may reach $300,000,000. Something like 30 percent of all mechanized equipment used by British armies in Africa and the Middle East was made in Canadian plants. A much higher percentage of the equipment used by the British Eighth Army in its victorious campaign was of Canadian Manufacture.

A new all-Canadian transport plane is the ambition of Canadian government officials and Canadian designers are now working on plans. Production is not expected to commence for two years. In the meantime, however, a Canadian government-owned aircraft plant is adapting the Lancaster bomber for transport use and these transport planes will be used soon in a new transport service to be operated by Ottawa for carrying army personnel, government officials and emergency supplies between this country and Britain.

WPB SHIFTS ANNOUNCED

WASHINGTON—Appointment of Hiland G. Batcheller as operations vice chairman of the War Production Board, and the shift of Donald D. Davis from the position of operations vice chairman to the vice chairmanship formerly held by Ralph J. Cordiner, have been announced.

Mr. Batcheller, who has been director of the steel division, will continue to direct the work of the division.

Reporting to Mr. Davis in his new vice chairmanship will be the Facilities Bureau, the Office of Progress Reports and the Office of Special Projects, the Office of Production Research and Development, the Statistics Division, the Procurement Policy Division, the Resources Protection Board and the Planning Committee.

INSIDE DETROIT

BY SILER FREEMAN

Race troubles and wildcat strikes cut June production. Kaiser reveals plans for light postwar car, criticizes present design. Greyhound is ready to back itself in the postwar helicopter race with heavy cash on the line

One Million Manhours Lost Torn by racial hatreds and beset by never-ending wildcat strikes, the automotive industry's proud production record since Pearl Harbor has suffered severe setbacks. While no one in official capacity would venture to estimate how much output had been lost by the recent riots, unofficially it has been set at around 1,000,000 manhours.

All plants were hit hard by the disorders which brought out Federal troops to restore at least a semblance of order. In one small department at Ford's which employed twelve negroes, only four were on the job the day after the severest rioting, and in the war-vital aluminum and magnesium foundries, only 20 percent were present. A vacillating policy was responsible for the high absenteeism in the plants. At first, the negroes were ordered to stay in the plants, then the order was rescinded.

At Briggs and Murray, the night shifts were sent home between 7 and 8 p. m. of the first day of disorders. The negroes pleaded with the management to let them go home before nightfall and after some debate, they were allowed to leave. Consequently, for the rest of the week very few showed up for work and absentee records hit new highs.

Trouble Breaks Elsewhere And if that were not enough, the supervisory forces at Ford Rouge and Willow Run began a series of sporadic walkouts that threatened to close down both plants. The independent union to which the foremen belong was snubbed by the CIO, which ordered their members to go through the picket lines. Without the foremen, however, production was adversely effected in a number of departments. A compromise was finally reached between the union and the Ford management with the War Labor Board promising to look into their grievances.

Willow Run Cut Severely But between the strike and the racial troubles, Willow Run was hard hit. Just a week before the double-headed flareups began, the bomber plant was "going to town." May had been a very good month production-wise but June promised to be the banner month since the plant was built. The employment rolls had been brought up somewheres near its peak with the addition of hundreds of over-38 discharged soldiers and the importation of new workers from the South.

Everything was clicking and an inspection of the assembly lines showed the gigantic Liberators moving out at a high pace. It was the most encouraging sight in the entire Detroit picture.

Production Almost Stopped But along came the race riots which hampered many departments. And not far behind came the trouble with the foremen in which many were fired and the rest walked out. Production slumped heavily and on Sunday, one week after the first foreman trouble, production was almost non-existent. For the first time in many months, very few lines were in operation. Those workers, accustomed to working on Sundays, had not been called in.

During the week, little was accomplished. The lines which had stock worked them out and then let the machines sit idle, waiting for someone to instruct them what to do. With no one to order dies changed and new stock, the operators stood by with nothing to do. Shortages in one department were felt in others and the whole plant slumped badly.

Where just two weeks ago, it was confidently expected that May's output would be topped by at least one-third, June's production may now not even equal last month's. The supervisory force, however, has now been pacified and is back on the job so that the final days may save June from too bad a slump.

Blow Some Trouble Away — A piece of cord with a knot tied at one end is blown through a conduit, after which workers pull electric wire through. This saves 17 percent of time in wiring horizontal stabilizers, as compared to old method of pushing piano wire through the conduit

Kaiser Visits The Car Capital Dynamic Henry J. Kaiser blazed into Detroit and out again, leaving some few hints that he was definitely a competitor of the established automotive companies in the lower price field. Kaiser made a one-day stand but covered a lot of territory in that time.

He said that his postwar car would be manufactured out of non-strategic materials. The body will be of plywood, the frame will be tubular and of magnesium and the weight would be held down to a minimum to give

NEW PLANTS FOR OLD

DETROIT—Henry Ford's sale of his tire plant in its entirety to the Russian government was a puzzler to the industry.

But now it comes out why: The new synthetic tire division is about ready to go into operation, all newly equipped and modern. If the Russians ever received their tire plant, it will be an outmoded one by now.

Long-Range Training—An instructor in the Apprentice Training Department, Dodge Division, Chrysler Corp., teaches two college engineering students the intricacies of lathe operation. These boys are enrolled in the 5-year cooperative course in production and university engineering developed by Dodge in cooperation with the universities of Detroit and Cincinnati and Wayne and Northwestern universities

it considerably greater economy of operation.

He Reveals Car Plans

He then went into an afternoon-long conference with his engineering advisers, Probst and Harger, on his new military vehicle and his projected post-war model which he said would sell for about $400 and would be marketed through gas stations throughout the country on a cash-and-carry basis; no trade-ins.

Of Military Car But Won't Tell

ough communica- he would not discuss his military vehicle which he announced on his last visit to Detroit. It was learned, however, that there have been design changes in it and that he already has competition in that field. He admitted that since he submitted his designs to Brig. Gen. Alfred Glancy of the Tank-Automotive Center here, two or three other companies also submitted designs which have been accepted. The companies are said to be Willys, Chrysler and Ford.

Helicopter Plans Bring Arguments

Detroit may be the first battleground of the biggest war in the history of transportation. Greyhound bus lines have applied for a license to operate helicopters on a nationwide basis, especially on short hauls between Detroit, Flint, Grand Rapids and other cities in the vicinity.

C. Bedell Monro, president of Pennsylvania Airlines, which proved that short-haul operations by plane could be made profitable, took up the challenge on his visit to Detroit.

"Those with little experience in airline operations are trying to invade our field," he exploded. "Well, we're going to battle them from now until kingdom come. We'll give them the biggest fight in the entire transportation industry's history."

Manfred Burleigh, president of the local Greyhound lines, was unperturbed. He pointed out that his company had well defined routes, had a clientele that totalled 65,000,000 passengers in 1942 and that it had a right to go into the helicopter field, not as a competitor, he insisted, but as a feeder for the airlines, servicing out of the way communities.

And just to show that it wasn't a Buck Rogers dream that the company had concocted, he gave the clincher: "We are prepared to spend $12,000,000 on helicopters."

Patent Changes Urged

WASHINGTON—Shortening of the patent term to 20 years from application date, the recording of all patent agreements with the United States Patent Office to expose any secret, improper or illegal understanding and the throwing open for manufacture of any invention necessary for national defense, public health or safety are among the recommendations made to President Roosevelt by the National Patent Planning Commission.

The commission was appointed in December, 1941, after the patent system had come under criticism from the Temporary National Economic Committee and other groups as an alleged instrument of monopoly. Generally speaking, the commission report upholds the system as the foundation of American enterprise "and the basis upon which our entire industrial civilization rests." No evidence was discovered of the specific use of patents to hamper the war effort, the commission says.

The commission decided against the incorporation in American patent law of a compulsory licensing system. It recommends, however, a statutory provision that in a suit for infringement a patent owner shall be limited to reasonable compensation without prohibiting the use of the patented invention whenever the court finds that manufacture of the invention is necessary to the national defense or required by the public health or safety.

The commission's most important recommendation is that which proposes that the patent term shall not endure more than 20 years after the application has been filed. The present term of seventeen years would be retained except when a time longer than three years was consumed in obtaining a patent. Delays of more than three years would correspondingly shorten the seventeen-year term.

A public register in the Patent Office, in which a patent owner may declare his willingness to grant licenses under reasonable terms, is proposed.

To gain a definition as to what is "invention," and to assure its use in courts of law and the Patent Office, the report proposes that Congress enact laws setting a national standard whereby patentability of an invention shall be determined by the objective test of whether it advances the arts and sciences.

The recommendations conclude with proposals that questions of the patent validity, raised in an infringement suit, be referred to the Patent Office.

Bullard to Make Torpedoes

BRIDGEPORT, CONN.—The Bullard Co. will soon start the manufacture of torpedoes for the United States Navy. Orders originally placed with the Precision Manufacturing Co. plant at Fall River, Mass., will be transferred to The Bullard Co.

The change is to be accomplished over an interval of time, with the least possible disruption of existing conditions and circumstances consistent with the furtherance of the war effort, according to a statement by the Navy.

WARTIME WASHINGTON

BY BLAINE STUBBLEFIELD

Plans for postwar disposal government-owned defense plants are still nebulous. Planning is essential, for federal agencies own an estimated half of the country's metal working capacity. DPC plants, primarily, will interest industrialists

A Lion by The Tail Disposal of fifteen billion dollars worth of public-owned war production plant when peace comes will tax the ingenuity of whatever Administration is in power. About one-fifth of the country's production capacity will be owned by the government. Thus by ownership alone, to say nothing of legal control over production, standards, distribution and prices, the industry of the United States has been one-fifth socialized.

So far as the machine tool industry is concerned, the problem is not so much one of plant capacity as it is of a huge pool of machine tools themselves, owned by the government. Mainly this pool consists of tools that can be used on most any peacetime metalwork production—standard tools. This surplus consists of tools from ordnance plants that will go out of business, and from large portions of shipbuilding and aircraft plants which must be shut down. All of the aircraft plants will go as far as they can into other lines of durable goods. Cold calculation puts the postwar airplane market somewhere between two and ten percent of present production.

Government Owns Half of Tools Just what the machine tool stockpile amounts to has not yet been figured out. But during the four years ending with this year, about 875,000 machine tools will have been produced. This is about two-thirds the number of tools in operation in 1940. It is estimated however that about 70 percent of tools in place in 1940 were ten years old, and that the new tools in the Government's stock pile are about twice as efficient as the old ones. *Business Week*, in its most recent Report to Executives, quotes conservative opinion that the federal-owned pool of tools represents half of the metal-working capacity of the country.

Tabulation Shows Growth The tabulation of war industrial facilities on this page shows "machine tools and other metal working equipment" at the bottom of the list, which is arranged regressively in values in the middle column showing proportion of public ownership. According to these War Production Board figures, tool plant was expanded to the extent of $153,183,000 by the Government, and $140,369,000 with private funds, a total of $293,552,000. Spokesmen for the industry have said at various times that it has expanded as much as ten fold to meet the war need for tools. The ten is an arbitrary figure of course, depending on what pre-war year is taken as a base. WPB's tool shipment figures run up from $30,000,000 a month in 1940 to $130,000,000 per month at the peak. Thus, production was better than quadrupled.

It should be noted that the figures include "other metal working equipment" meaning non-machine tool units. Therefore, the figures would be smaller if they included only equipment that falls strictly within the definition of machine tools.

DPC Plant Sales Will be Slow The only reason why a machine tool builder might exercise his option to purchase a government-owned tool plant would be that the latter was far more efficient than his own. In fact, the producer, far from buying a new plant, may wonder what to do with his old one, or the new capacity which he has financed himself. It is reasonably certain that Defense Plant Corporation will be wondering too. Machine tool plants can make almost any metal work not of the mass production type, but, unless postwar business booms louder than anybody expects, there will be plenty of industry-owned plant for all purposes, with much of DPC's going begging.

As a general thing, Army and Navy built plants for making powder, for shell loading, built gun-boring lathes, and over-size forges—most of which are useful only in war and will be abandoned. DPC handled industrial plants, the kind, broadly speaking, which can produce for peace.

Purchase Options Limit Choosing Of the fifteen billion dollars in federal - owned plant, DPC had more than eight billions last October, mostly having post-

Value of War Industrial Facilities Financed With Public and Private Funds

Through March 31, 1943, in thousands of dollars

Product	*Total*	*Gov't financed (a)*	*Privately financed (b)*
TOTALS	c $19,338,997	c $15,139,822	$4,199,175
Aircraft, aircraft engines, parts and accessories	3,326,628	3,084,782	241,846
Explosives, ammunition loading and assembling (excluding small arms)	2,868,109	2,856,357	11,752
Ship construction and repairs	2,086,467	1,991,487	94,980
Guns, ammunition, shells, bombs	2,096,847	1,869,707	227,140
Chemicals, petroleum and coal products	1,968,734	1,303,751	664,983
Iron and steel products	1,816,392	1,261,238	555,154
Non-ferrous metals and their products	1,428,380	1,126,270	302,110
Machinery, electrical equipment and appliances	770,721	462,142	308,579
Combat and other motorized vehicles	502,550	424,950	77,600
Non-manufacturing (power lines, mining, transportation, etc.)	1,726,024	341,592	1,384,432
Miscellaneous manufacturing	454,593	264,363	190,230
Machine tools and other metal-working equipment	293,552	153,183	140,369

(a) Includes facilities estimated to cost more than $25,000 which are direct obligations of the War and Navy Departments (including financing through government supply and emergency plant facility contracts), Maritime Commission, Defense Plant Corporation, United Kingdom, and loans of the Reconstruction Finance Corporation.

(b) As reflected by necessity certificates approved. Beginning April 1, 1942 necessity certificates with an estimated cost of less than $25,000 excluded. Also exclude pilot and mechanic training.

(c) Includes 42 projects estimated to cost $180,508 thousand which have been deferred.

Construction of Facilities Analysed—The value of war industrial facilities financed with public and private funds reached $19,339,000,000 by the end of March, the War Production Board has reported. This includes all projects for which contracts have been let since June, 1940. Prewar plant equipment was estimated at $50,000,000. Of the total, $15,140,000,000 worth was financed by government funds; $4,199,000,000 was privately financed

Postwar Plan Pusher

CLEVELAND—Harry M. Grinton, regional vice president, McGraw-Hill Publishing Co., will head the Industry Action Committee of the Cleveland Committee for Economic Development. It will be the purpose of Mr. Grinton's section, during individual visits, to urge upon the heads of Cleveland enterprises the necessity of immediate planning to assure maximum postwar employment.

"Insofar as possible," said Mr. Grinton, commenting upon the work of his committee, "industry must be able to move directly from manufacture for war to manufacture for peace—and for that, planning must start at once."

war value. The standard DPC option price on plants is the larger of two figures: cost less depreciation or DPC investment less rental income received. Nearly all of the plants are well built, none of the strictly temporary kind. But none was designed with peacetime production in mind, and considerable conversion will be necessary. Also unfavorable to private purchase is the all-or-nothing clause, which means that if the manufacturer takes up the option of facilities he is renting, he must take the works; he cannot pick and choose. This applies only to the locality, however. If the manufacturer is in Hartford he can take all rented facilities there and skip others that he may be renting in Atlanta.

The Maritime Commission did not write purchase options into its contracts; owns most of its yards outright; there will be no further use for them for years. There are not purchase options in the cases of aluminum, magnesium and synthetic rubber. These industries are almost completely in the hands of the Government, to do with as it will.

Tool Conservation Campaign Is Instituted by the WPB

WASHINGTON—Adopting the slogan, "Tools are Weapons—Treat 'em Right," the War Production Board is starting a nation-wide campaign to conserve our country's limited supply of cutting tools.

Declaring that tool breakage is one of the most critical factors in industry today, Howard Coonley, director of WPB Conservation Division, called upon industry to establish definite tool care policies within individual plants.

Although many plants have encouraged tool economy in varying degrees in the past, tool conservation throughout industry now becomes an emergency "must." Cutting tools employ the most critical alloying metals —tungsten, molybdenum, cobalt, vanadium and chromium. The greater part of our supply of these metals is obtained from foreign sources and cannot be materially increased during the present conflict.

New Workers a Factor

Coupled with this shortage of tool materials is the fact that over nine million workers are now using cutting tools for the first time.

The primary recommendations of the Board are that plant training programs include tool conservation as a definite subject in the curriculum; that tool conservation be placed upon a plant-wide policy basis—applying to every person who handles tools and organized through a group representing both workers and management personnel; that tool manufacturers and other industrial advertisers feature the importance of tool care in their messages and campaigns.

Promotion Material Available

A limited amount of graphic material will be available including three-color posters, small stickers, and news material for employees' magazines. The WPB Division of Information will be available for special assistance and data on the subject for use in connection with special plant campaigns. The campaign slogan, "Tools are Weapons—Treat 'em Right," will be featured on all printed matter and plant campaign chairmen are requested to use it in connection with their local promotions.

One of the most important phases of the campaign is the program to encourage the tipping of high speed tools. To further this, WPB has issued a chart on approved methods of tool tipping.

WAR RULINGS IN BRIEF

Checklist of Significant Regulations on Materials and Prices

AIR CONDITIONING MACHINERY—Required specifications have been established for manufacture of this machinery and for refrigeration condensing units. (Schedule II to Limitation Order L-126 as Amended.)

CIRCUIT BREAKER EQUIPMENT—Controls on manufacture of certain items of this electrical equipment have been established. Order does not affect circuit breakers of multi-breaker class. (Conservation Order L-300.)

CLASS A & B PRODUCTS—Manufacturers must continue to identify all rated orders for production materials with allotment number assigned to the related production schedule under CMP procedure. (Interpretation 3, CMP Regulation 3.)

Where delivery order calls for delivery in successive months, of Class A products in quantities less than minimum practicable production quantity, and compliance with monthly production schedules would result in substantial interruption of production, manufacturer is permitted to exceed his authorized production schedule. (Interpretation 9, CMP Regulation 1.)

FERROUS FORGINGS—Any reference in the regulation governing sale or purchase of this product includes both transactions in which person producing the ferrous forging furnishes the materials and those in which all or part are furnished by customer. (Amendment 3, Maximum Price Regulation 351.)

GUARDS OR HOUSINGS—Steel may be used in manufacture of these items on mechanical power transmission drives. (Limitation Order L-193 Amended.)

MACHINERY—Wholesalers of machinery, whose products are essential to war program, have been provided with new methods for obtaining adjustment of maximum prices similar to methods available to manufacturers of essential machinery. (Amendment 92, Regulation 136.)

MATERIALS—Direction for replacement of defective steel, copper and aluminum has been issued, providing for material rejected by customer because of non-conformity with specifications. (CMP Regulation 1, Direction 16.)

MOTOR CONTROLLERS — No manufacturer can accept any order or commence manufacture in fulfillment of any order for any electric motor controller or part thereof unless such are in accordance with standards prescribed. (Conservation Order L-250 Amended.)

OXY-ACETYLENE APPARATUS—No non-ferrous metals or stainless steel can be used in manufacture of specified parts or portions of manually operated apparatus. (Conservation Order L-268 Amended.)

STEEL CASTINGS — Maximum prices for machining performed by producer have been established on basis of his March 31, 1942 machining rates or on his base period costs and profit margin. (Amendment 6, Revised MP Schedule 41.)

TUBING & FRAMES—In the case of any person using alloy steel airframe and engine tubing in the production of aircraft or components thereof, minimum quantity shown on Schedule A of CMP Regulation shall not apply. Instead, he may accept delivery under paragraph (c) (3) of whichever is smallest—5,000 lb. or 10,000 ft. or minimum mill production run.

SPOTTING THE AIR NEWS

There's a struggle between those who would make air transport auxiliary to surface lines and those who would keep it separate. Warplane construction emphasizes bombers. Postwar disposition of warplanes is receiving consideration

Again, as in 1937, the Maritime Commission is making a bid for a share of jurisdiction over American flag transocean airways. Shipping men feel that, rather than be compelled to meet the competition of over-sea airlines, they themselves should have the benefit of the airplane as an auxiliary. The Commission's previous proposal, supported with a report by Grover Loening, pioneer airplane designer, was that its ship construction and operating subsidies be applied to oversea aviation. After a long controversy, Congress turned the proposition down.

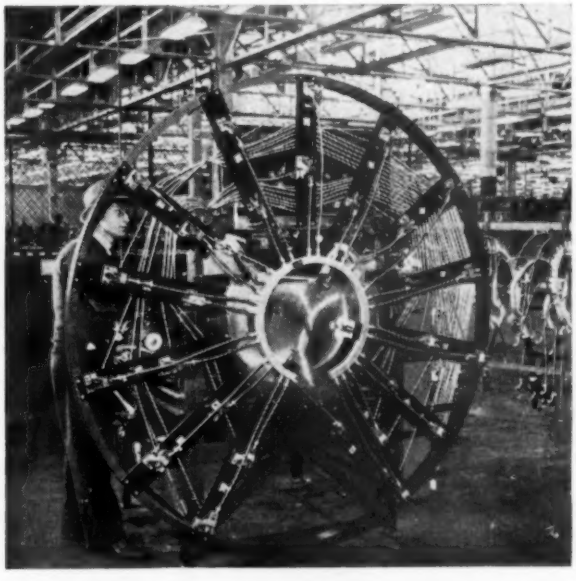
There is no telling, this time, what will come of it. The Commission has a committee making a study which will take a year or so to complete. Legislation will be recommended. It will be opposed by the Civil Aeronautics Board, which decisively supports its own civil aeronautics law, which prohibits control of airlines by surface (rail, automotive, steamship) transportation companies. Now, the bus lines, railroads, and merchant marine are all contesting the right of airmen to keep exclusive control in the air, simply because they were there first. It is a safe prediction that the surface transport people will get into the air eventually.

Warplane construction is broken down into types by General Arnold, chief of the Army Air Forces, testifying before a senate committee on the "frightful" $71,500,000,000 military appropriation for fiscal 1944 beginning July 1. Arnold says the fund provides for 99,740 planes. This figure should not be confused with the plane programs of 1943 and 1944, which are changed so often no one can keep track of them. Appropriations are still unimportant: congress simply provides money for the maximum output of industry. And in the bill, a specific number of airplanes had to be mentioned. The interesting point is that the total is broken down into types, a thing that has not been done since before the war. It includes 36,000 bombers, 38,000 fighters, 12,000 transports, and only 9,000 trainers. The remaining 10 percent are miscellaneous.

Such a fleet of transports—12,000—is enough to set the whole airline world agog. It is fifteen or twenty times as many planes as all the airlines in all countries combined were operating when the war started. It is enough to set them all up in business when peace comes. Much of this equipment will be obsolete, but it won't matter; many of our present transports are 8, 10, or even 15 years old. These war transports are easily convertible: they will need only plush seats, galleys, washrooms. Of course, the war would have to go on a couple of years for us to accumulate 12,000 transports. At present we have only several hundred, all told. If we do get the whole fleet, the problem of disposing of it, to domestic and foreign operators, the while almost wiping out the market for postwar-built planes, will be a man-size one. Incidentally, it should be noted that the bomber program is almost equal to the fighter program, a thing unheard of a few months ago. The small number of trainers indicates that our air force training program is approaching completion.

Surplus aircraft problem is recognized by Clarence Lea, veteran aviation legislator, chairman of the House Interstate and Foreign Commerce Committee, in the introduction of a bill to regulate and control the disposal of warplanes. Mr. Lea would amend the Civil Aeronautics Act to give the Civil Aeronautics Board a director who would handle this matter. All surplus warplanes would be transferred to him upon cessation of hostilities. If the nations should disarm, there will be a mountainous scrap-pile of bombers, hot-flying fighters and trainers completely worthless for anything else, except scrap. (It is predicted that barnstormers will take a few of the most famous types, at $500 or so apiece, and give you a joy ride—if you want one.)

The time has come, now that the enemy is outclassed in the air, when you will know the production figures on all warplanes except a few new experimental types, like the three superbombers now in the works. The Air Force right now is preparing a directive which will clamp the lid on so that these cannot even be mentioned in print. As for the others, General Arnold says that we will produce 112,000 planes in the next 12 months. This is approximately in line with the programs recently set forth in these columns. He says that every day 66,000 American pilots take the air against the enemy in all parts of the world; that 1,600 planes leave U. S. airports daily; not all are new deliveries. Our production rate is now about 250 a day.



Spiderweb — The Buick harness ring checking device inspects aircraft engine ignition systems by revealing broken wires and incorrect timing. This testing ring detects a faulty ignition system before it is assembled on a Buick-produced Pratt & Whitney bomber engine, thereby saving much assembly time

All-wing airplanes, equipped with eight engines of 3,000 horsepower each, are predicted for the postwar period by J. C. Hunsaker, chairman of the National Advisory Committee for Aeronautics, aerodynamics and engine laboratory to the Army, Navy, and civil aviation. This is confirmation of development work being done on warplanes. All-wing, or tailless plane, are correct terms for what is erroneously called a "flying wing." (All wings fly.) Many authorities will disagree with Hunsaker, not on the feasibility of such large planes, but on their utility value. Dr. E. P. Warner, vice

chairman of the Civil Aeronautics Board, who has just had the honor of delivering the annual Wilbur Wright Lecture (in London) says that smaller planes, making frequent departures on the transatlantic routes, will best serve the traveling public.

Helicopter mania continues unabated. The public is wild on the subject. Practically every aircraft builder in the country is designing one or more. No less than 20 were on blueprint paper at last count.

Steel Output Pushed

WASHINGTON—Theodore K. Quinn is getting important help in his new assignment of stepping up WPB's lagging "Production Drive" as a by-production of WPB's push for extra steel production in the third and fourth quarters. The Drive has been stymied in recent months by labor's increasing c nviction that labor-management production committees in the plants aren't taken seriously.

Now WPB boss Charles Wilson is leaning heavily on the labor-management committees in steel in his campaign to step up output of present capacity by some 300,000 tons a quarter (remainder of the 1,000,000-ton objective is to come, about equally, from new capacity and from inventory). Wilson got a cool response from steel management to his insistence that present mills can be pushed harder, but he found the steel unions anxious to demonstrate that it could be done.

Bell Sets Up Divisions

BUFFALO—The growth of Bell Aircraft Corporation's activities has resulted in the establishment of three major divisions encompassing its various activities and the appointment of section managers to head them, it has been announced by Lawrence D. Bell, president and general manager of the company.

Ray P. Whitman

Ray P. Whitman, first vice president of the company, in addition to holding this position, becomes manager of the Niagara Frontier Division, which includes plants at Niagara Falls and Buffalo. Vice President and Assistant General Manager Omer L. Woodson becomes vice president and manager of the Georgia division, embracing the activities at the Bell bomber plant at Marietta. He will be aided by Capt. Harry E. Collins, who becomes vice president and assistant manager of the Georgia division. Carl F. Lozon continues as manager of the company's ordnance division.

Omer L. Woodson

Carl F. Lozon

Charles L. Beard, secretary and treasurer, will head the home office.

Barnes and Hunsaker Speak at Goodyear Lab. Dedication

AKRON—An anti-aircraft gun that can fire projectiles 60,000 ft. into the sky is now manufactured in huge quantities, Major General G. M. Barnes, chief of the technical division, Ordnance Corps, told an assembly of scientists recently at the closing ceremonies of the dedication of the new research laboratory of the Goodyear Tire and Rubber Co.

The new stratosphere weapon is a 4.7-in. gun which can fire with accuracy at 60,000 ft., General Barnes stated. This is about 20,000 ft. more than that of the best anti-aircraft gun previously available, and is believed to exceed by far anything in the possession of our enemies.

General Barnes revealed some hitherto undisclosed details of the "bazooka," the deadly portable anti-tank weapon which can be operated and carried by two infantrymen. It weighs about twelve pounds and is about 3½ ft. long. The 2½ in. projectile, he said, is really a rocket and can be fired from the infantryman's shoulder, as it is open at both ends and has no kick-back. The action is blasting rather than penetrating and most of the effect is incendiary, the projectile after it pierces the tank, setting the ammunition and fuel on fire and causing the tank to blow up.

Postwar airplane engines of 24 or 36 cylinders, giving more than 3,000 hp., and giant flying boats equipped with six or even eight 2,000 hp. engines, were pictured at a symposium on the present and future transportation by Dr. Jerome C. Hunsaker, chairman of the N.A.C.A.

The combustion gas turbine, he added, gives every promise of being most useful in large units. From our present experience, he said, it was fair to predict that we would have suitable alloys for the high temperatures involved, and that our super-charger art was adequate to provide the efficient compressors needed for a gas turbine power plant.

Propellers for much more powerful engines present a serious problem which might delay development of giant airplanes, Dr. Hunsaker said.

"It is not unreasonable to predict," he declared, "a possible 20 percent saving in the weight of the airplane by the use of materials of higher strength and stiffness, and by more refined design, substitution of magnesium and plastics, and the elimination of unnecessary gadgets."

NAMES in the NEWS

A. M. Wibel, formerly vice president and director of Ford Motor Co., has joined Nash-Kelvinator Corp., Detroit, as vice president. Mr. Wibel became associated with Ford 31 years ago and was successively promoted from engineering clerk to head of engineering purchasing, then to director of purchases, and to vice president in 1941. Another executive appointment at Nash-Kelvinator is that of R. A. De Vlieg, who has been vice president of the Nash Motors Div. in Wisconsin. He has been named vice president in charge of manufacturing with headquarters in Detroit. Mr. De Vlieg is a veteran of the automotive industry, beginning his career as a designing engineer with Cadillac in 1910. He became Chrysler works manager in 1927, and in 1930 resigned to become vice president of Reo Motor Car Co. Following that he joined Nash in 1936, taking charge of the Kenosha division in 1937.

Brown Instrument Vice Presidents

P. L. Goldstrohm

G. M. Muschamp

George M. Muschamp and Paul L. Goldstrohm have been named vice presidents of the Brown Instrument Co., Philadelphia, a subsidiary of Minneapolis-Honeywell Regulator Co., makers of indicating and controlling instruments. Mr. Muschamp, who has been with the Brown engineering department for 12 years and in charge of engineering for the past three years,

becomes vice president in charge of engineering. Mr. Goldstrohm has been associated with the company for 20 years and has been serving as assistant general manager for the past two years. In this new position he will have charge of production.

Daniel C. Green

Daniel C. Green has been named president of Cleveland Pneumatic Tool Co. and its subsidiary, Cleveland Pneumatic Aerol Inc., Cleveland. Mr. Green was formerly head of the Central Service Corp., Chicago utilities specialists, and is a co-receiver of the Chicago Street Railway System. He was at one time vice president of the Electric Bond & Share Co. In 1933 Mr. Green went to Chicago on court appointment as trustee of the Samuel Insull utilities.

Harry G. Sparks, previously vice president of Sparks-Withington Co., Jackson, Mich., makers of auto appliances and radios, has become president of the company.

Harold E. Hall has been named president of Metals Disintegrating Co., Elizabeth, N. J., producers of metal powders and dust. For the past six years Mr. Hall has been general manager of the firm.

E. Q. Smith has joined the Aga Metal Tube Co., Elizabeth, N. J., as president. Formerly Mr. Smith was vice president of Bundy Tubing Co. and connected with the firm for 15 years.

David MacGregor has been named chief engineer of Edward Valve & Mfg. Co., E. Chicago, Ind., with which company he has been associated in various engineering capacities since 1925.

H. B. Hodgins, an application engineer for Westinghouse Electric & Mfg. Co. in Spokane, Wash., area since 1935, has become manager of the company's Spokane office at South 158 Monroe St.

David F. Austin has resigned as assistant director for production in the Steel Div. of the War Production Board and has resumed his duties as vice president of Carnegie-Illinois Steel Corp., Pittsburgh.

Walton L. Woody has been appointed vice president in charge of operations of National Malleable & Steel Castings Co., Cleveland, manufacturers of railway specialties and auto castings. He joined the company in 1914 and has been assistant to the president and in charge of the Sharon, Pa., and Melrose Park, Ill., works.

Edgar C. Brandt has been appointed general works manager of Elliott Co., Jeannette, Pa., steam power specialties. In 1905 Mr. Brandt joined Westinghouse Electric & Mfg. Co. at E. Pittsburgh, working his way through such positions as assistant to the director of manufacturing operations, supervisor of equipment and methods, works manager of the Homewood Wks., and assistant general works manager at E. Pittsburgh. He went to Washington in 1941 as technical consultant of the Production Div. of OPM, and last year transferred to Detroit for the War Production Board as manager of the Machine Tool & Equipment Div.

G. E. Merkle has been named sales manager of Perfex Gage & Tool Co., Detroit. Mr. Merkle has been in the automotive industry since 1916, having been associated with Chevrolet and recently a Chrysler distributor for the State of Wisconsin.

Jack Zimmer

Jack Zimmer has been advanced from chief engineer to vice president of Edward Katzinger Co., Chicago, now devoted to war production but normally makers of kitchen utensils, tinware, flashlights. He started with the organization as toolroom foreman in 1932, and was previously with International Business Machines Corp. Mr. Zimmer spent several years with the A & J Co. of Binghamton, N. Y., manufacturers of kitchen utensils, before it was purchased by the Katzinger Co.

John D. Leitch has been appointed chief engineer of Electric Controller & Mfg. Co., Cleveland, makers of automatic controllers and motor starters. Previous to his association with the firm since 1937 Dr. Leitch was connected with the Steel Co. of Canada.

Cornelius B. Dorgan has been made factory manager of Cleveland Welding Co., Cleveland, auto steel parts. He has been with the company for the past 30 years, serving 18 years as master mechanic.

Ronald S. Walker has taken a position with Stokerunit Corp., stoker drive makers, as eastern sales manager with headquarters at 1 Collins Ave., Bloomfield, N. J. Mr. Walker was formerly associated with Harrington-Wilson-Brown Co. of New York City, machine tool dealers.

H. B. Jameson, formerly of the Philadelphia office of Aro Equipment Corp., pneumatic tools, has been named division manager of the New England territory with headquarters at 52 Harvard Ave., Boston.

J. W. Hennen, New Orleans assistant division manager of Consolidated Vultee Aircraft Corp., has been named Nashville Div. manager. He entered the aircraft industry in 1928 when he became production chief of the Boeing Aircraft Co. plant at Seattle, joining Consolidated in 1939 as production manager of the company's Vultee Field, California Div.

BUSINESS ITEMS

C. T. Hansen & Co. has been appointed Pacific Coast sales representative of Lukens Steel Co. and its subsidiaries, By-Products Steel Corp. and Lukenweld, Inc., Coatesville, Pa. Offices have been established at 628 Security Title Insurance Bldg. in Los Angeles, 423 Russ Bldg. in San Francisco, and at 6115 Arcade Bldg., Seattle.

Quimby Pump Co., with plants at Newark and New Brunswick, N. J., has been purchased by H. K. Porter Co. of Pittsburgh. The Quimby plants will operate as a division of the Porter company, manufacturer of industrial locomotives and chemical processing equipment.

Clearing Machine Corp., Chicago, manufacturer of pneumatic and hydraulic presses and pneumatic cushions for die presses, has just completed a new assembly building, substantially increasing the company's productive capacity.

York Ice Machinery Corp. has announced a change in its corporate name to York Corp. as a result of a merger with a subsidiary and recapitalization. The company is a large producer of refrigeration and air conditioning equipment.

Aircraft Accessories Corp. will open its ninth plant in the Kansas City area as a result of rapidly increasing production being performed by the firm.

Doyle Machine & Tool Corp., Syracuse, N. Y., has leased additional space for increasing production of parts for aircraft landing gears, variable pitch propellers, aircraft gun mounts and aircraft carburetors.

Moise Steel Co., Milwaukee, has been purchased by United States Steel Supply Co. which will continue the steel warehouse business formerly conducted by Moise in that city. Carl Gallauer, formerly vice president of Moise Steel Co. has been appointed district manager.

Lindsay and Lindsay has moved to larger quarters at 4825 S. Rockwell St., Chicago, to speed up production of

Lindsay structure for war equipment. The company's increased manufacturing facilities will be immediately available after the war for the prefabrication of cabinets, housings, truck bodies and other metal structures.

Sylvania Electric Products Inc. has announced the formation of an International Division in its office in New York City, with Walter A. Coogan as director. As part of its expanded activities in the manufacture of incandescent, fluorescent lamps and fixtures, radio and electronic tubes, this division will include the operations formerly carried on by the Foreign Sales Dept.

Industrial Engineering Ltd., Vancouver, B. C., has acquired the chain saw manufacturing industry founded by Donald J. Smith and operated in recent years as a subsidiary of Reed-Prentice Corp. The company has opened a branch in the Confederation Bldg., Montreal, under the direction of Ralph M. Weekes, which includes a service branch with a full stock of replacement parts.

OBITUARIES

Earle D. Parker

Earle D. Parker, vice president and general works manager of Barber-Colman Co., Rockford, Ill., makers of machine tools, automatic controls and motors, passed away suddenly at the age of 63, while making arrangements at his farm to entertain a group of friends. He had been employed in the engineering and management divisions of the company for the past 20 years and had been connected with the firm for 40 years. Mr. Parker became vice president last year, following the death of Howard D. Colman in an automobile accident.

He graduated from Cornell University as a mechanical engineer, and previous to his association with Barber-Colman Co., worked for two years with the Fairbanks-Morse Co., Beloit. For many years he was active in the National Machine Tool Builders' Assn. He was a member of the board of directors of the Metal Cutting Tool Institute, director of Machinery and Allied Products Institute, and on the advisory committee on metal cutting tools of the War Production Board.

David E. Ross, 71, for many years vice president and general manager of Ross Gear & Tool Co., Lafayette, Ind., died in that city recently. He had retired from the company in 1927 and became chairman of the board. Mr. Ross invented a steering gear bearing his name, which is widely used on automobiles. For a number of years he had been a member of Purdue University board of trustees.

William E. Sykes

William E. Sykes, famous authority on gears and inventor of the Sykes continuous tooth herringbone gear and gear generating machine, passed away in England. He began his career in a large gear plant in England after graduation from Leeds University, and designed and supervised the manufacture of a large quantity of machinery and equipment in that country. In 1923 Mr. Sykes joined Farrel-Birmingham Co., Ansonia, Conn., which acquired the American rights to the Sykes process of gear generation. At the company's Buffalo plant he devoted his efforts to the development of the gear machine. In 1937 he returned to England to operate his own plants, retaining a connection with Farrel-Birmingham as consulting engineer.

Frank A. Lawler, executive vice president of Ziv Steel & Wire Co., Chicago, died in Chicago at the age of 59. He had also been secretary of the Suburban Tool & Mfg. Co. of La Grange, Ill. For 22 years prior to joining Ziv in 1928 Mr. Lawler had been associated with Crucible Steel Co. of America.

W. B. Gillies

William B. Gillies, vice president in charge of operations of Youngstown Sheet & Tube Co., Youngstown, Ohio, since 1933, died of a heart attack at the age of 59. He became associated with the firm in 1923 when it acquired the Steel & Tube Co. of America at Chicago. He was district manager of operations in Chicago until late in 1929 when he was transferred to Youngstown as assistant vice president.

Raymond M. Owen, pioneer automobile manufacturer, died in Westport, Conn., at the age of 70. Mr. Owen built the Owen-Magnetic and designed and built the Dyneto starting and lighting equipment.

Edward T. Fay, 47, vice president of Central Die Casting & Mfg. Co., Chicago, for the past ten years, was killed in an automobile accident recently.

Charles E. Lindell, president of Lindell Drop Forge Co., Lansing, Mich., died at the age of 61. He had organized the company in 1923.

Frederick W. Hodges, formerly president of the Detroit Lubricator Co., until his retirement in 1941, passed away in Detroit. Mr. Hodges was also a director of the American Radiator Co.

G. K. Abbott, president of the Abbott Ball Co., Hartford, Conn., died recently after a short illness.

William R. Day, 72, president of the Day Piston Co., Cleveland, passed away. Mr. Day had been president of the organization for the past 23 years.

Harry Glaenzer, formerly vice president in charge of engineering, Baldwin Locomotive Wks., Eddystone, Pa., died at the age of 67. He retired from the company in 1940.

James A. Seymour, retired manufacturer of steam and diesel engines, passed away at the age of 78 in Auburn, N. Y., after a long illness. He was formerly president and chairman of the board of McIntosh & Seymour Corp., makers of engines, now a part of the American Locomotive Co. In World War I Mr. Seymour aided the government in the development of diesel engines for submarines.

Howard Jones, works manager and vice president in charge of production of White Motor Co. since 1937, died at the age of 47 following a heart attack. Mr. Jones joined the firm in 1924 and advanced to shop engineer in 1928, assistant production manager in 1936 and then to general superintendent and production head.

Harry S. Hitchcock, 72, president of Apex Steel Corp., Los Angeles, died of a heart attack. He was previously vice president of the old Baker Iron Wks. and had been connected with the West Coast steel industry since 1902.

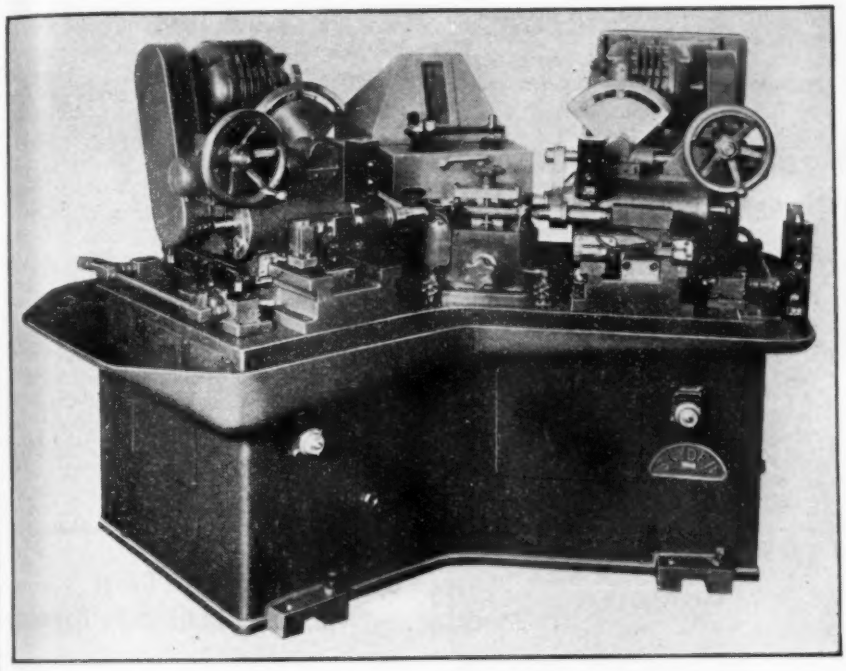
Karl King, 63, general superintendent of Wickwire Spencer Steel Co., Palmer, Mass., wire and wire products maker, died at his home recently. Mr. King became assistant superintendent of the Worcester plant of American Steel & Wire Co. in 1906, and in 1920 became superintendent of the rope mill at Wickwire, five years later assumed superintendency of the entire plant.

MEETINGS

Silver Bay Industrial Conference. Annual meeting. Silver Bay, N. Y. July 28-31.

SHOP EQUIPMENT NEWS

Snyder Produces a Semi-Automatic Machine To Weigh and Balance-Mill Connecting Rods



For weighing and balance-milling connecting rods, Snyder Tool & Engineering Co., 3400 East Lafayette St., Detroit, Mich., has available a semi-automatic machine. While the machine illustrated is designed for handling one connecting rod and the distance between centers in the large and small pin holes is fixed, two or more connecting rods of various lengths and weights can be balance-milled on a machine of this type by providing suitable adjustors on the scale and fixture. A small amount of excess stock is left on each end of the forging and by milling into this metal excess weight is accurately removed.

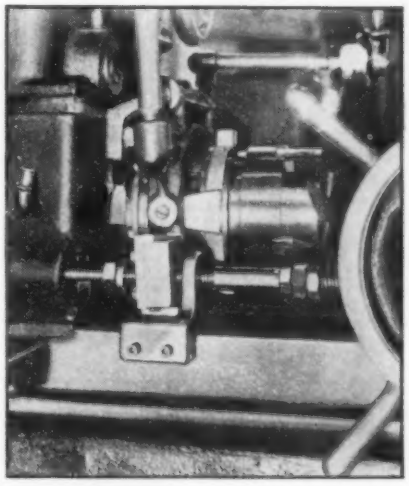
Lights are used on this machine to indicate the accuracy in locating the stock to be removed. An excess adjustment of as little as 0.002 in. causes the red light to flash on, warning the operator to retract his adjustment until only the green light remains lighted. The work piece is first weighed and the amount of excess stock on each end is determined by means of a double dial shadowgraph scale. The piece is then clamped in the fixture manually, and by turning a handwheel, the operator advances a finder which locates the excess metal on the connecting rod and immediately flashes on a green light. This operation automatically springs the cutting tool into alignment with the tip of the finder. The operator sets the pointer on the fan-shaped dial, located above the milling unit, at the amount of excess stock which the scale indicated should be removed, and this sets the cutter in position to remove that amount of stock.

After the settings are made for each end of the connecting rod, an electric pushbutton is pressed and both units feed the cutters past the work, removing the excess stock, and bringing the rod to correct balanced weight within the usual quarter-ounce limit.

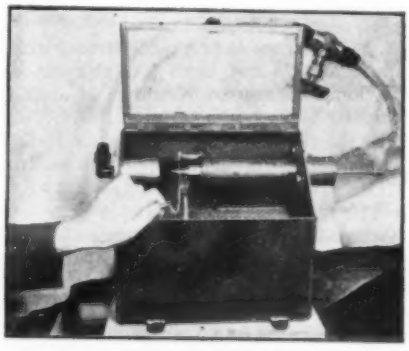
Quick-Opening Mechanism Now Made for Landis Diehead

A quick-opening mechanism has been developed by Landis Machine Co., Waynesboro, Pa., to open the diehead of the 7V Lanco hardened and ground head, so that the travel of the carriage ordinarily required to open the head will not affect the lead or pitch diameter of the work.

The mechanism comprises a spring in combination with a latch and latch block arrangement in addition to the conventional yoke employed to open and close the head, and can be applied to the Landis ⅞ in. single or double head threading machines. It is adjustable for threads of different lengths by moving the latch operating sleeve on the trip rod and moving the latch block bracket along the ways of the machine. Means are also provided to adjust the tension of the spring.



In operation the yoke is employed to close and latch the head within itself. When the head is in the closed position, the yoke also locks independently of the diehead. As the yoke closes the head, tension is built up in an extension spring. One end of this spring is anchored to the machine bed and the other end is attached to the yoke. As the threading operation progresses to the point where the diehead is to be opened, a sleeve on the trip rod raises the latch from the latch block, releasing the yoke and permitting it to snap back quickly, causing the head to open instantly.



American Bearing Washer Eliminates Manual Handling

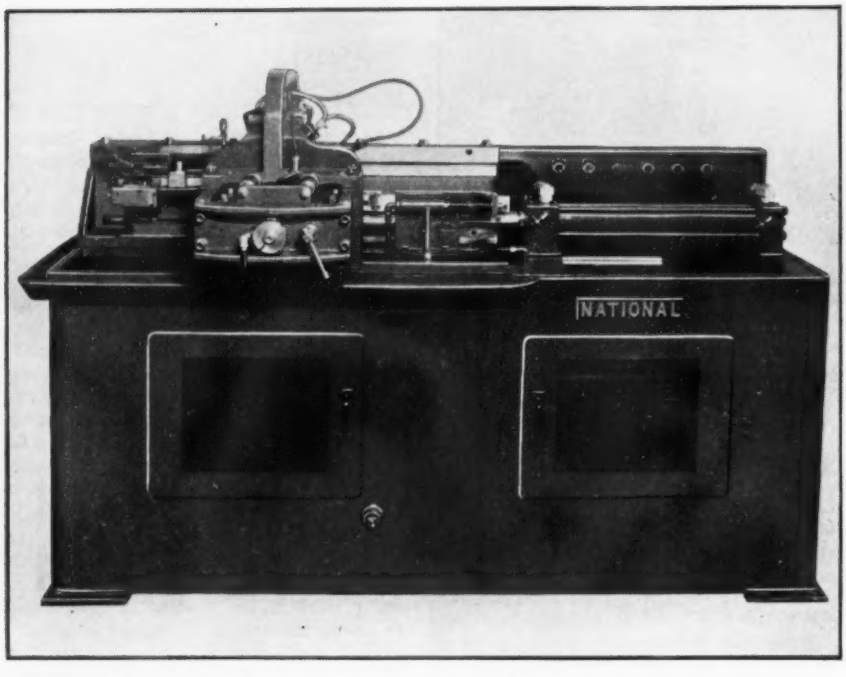
A machine to clean and oil bearings individually without exposing them to the air or handling, has been brought out by American Foundry Equipment Co., Metal Washing Div., Mishawaka, Ind. The unit handles bearings in sizes from ¼ up to and including 1¼ in.

outside diameter. Over-all dimensions of this bearing washer are 17×19×15 in. high. It consists of a solvent container, a fractional horsepower solvent pump, solvent filter and bearing adapters. This same bearing washing machine can also be used for removing dirt and abrasive particles from bearings used in motor and machines.

In operation the bearing race to be cleaned is slipped over the adapter and after releasing a small plunger knob, the bearing is injected into the spray nozzle entrance. The solvent, under high pressure, is discharged from the nozzle and faced between the race and the balls of the bearings. By twirling the operating knob, all surfaces of the raceways can be exposed to the solvent. To eliminate manual handling after cleaning, an ingenious stripper mechanism is provided to remove the bearings from the adapter. They are then discharged into a container.

The solution is continuously recirculated, and before reaching the nozzle it passes through a filter to remove dirt particles. If it is necessary on certain types of work to remove excess solvent from the cleaned bearings, an air hose connection can be built into the cleaning unit to provide clean filtered air. All parts of the machine are Parkerized to provide rust protection. A non-breakable plastic door enables the operator to view all operations.

National Hydraulic Precision Thread Rolling Machine Makes Class 3 and 4 Threads on Alloy Steel Bolts

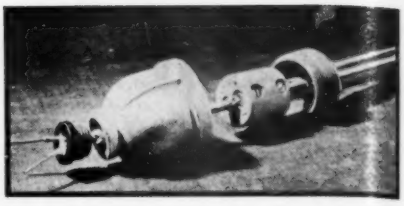


A full hydraulic, precision thread rolling machine has been brought out by National Electric Welding Machines Co., 1846-60 North Trumbull St., Bay City, Mich., for rolling threads on alloy steel bolts, having tolerances within those of Class 3 or 4 threads.

The machine incorporates a complete hydraulic system for actuating all moving members. The reciprocating ram to which the moving die is attached is operated by a direct-connected hydraulic cylinder, which insures smooth transverse operation, eliminating mechanical wear of parts which could otherwise cause defective threads. The hydraulic drive with its variable speed control allows proper speeds to be selected to suit the steel being rolled.

The thread rolling die is attached to a saddle block which in turn is mounted on three adjusting wedges. By having a compound screw adjustment on these taper wedges, micrometer movement of the wedges can be obtained. The face of the moving die can thus be aligned with that of the stationary die, providing accurate control over the taper or parallel requirements of the thread being rolled. Because it is often desirable to elevate the moving die to match the stationary die, a micrometer screw adjustment of another wedge makes this possible.

During the process of thread rolling, a hydraulic pump provides a flood of flushing oil to the faces of the dies while in operation, and also provides a pressure lubricating system to the moving members of the machine. After the part has been rolled, it drops into a chute which is lined with leather to prevent marring of the highly finished thread surfaces. Then it rolls into an oil bath which cushions the movement into a receiving pan, thus further protecting against damage. On high production parts, a hopper feed can be applied for automatically feeding the bolt blanks.



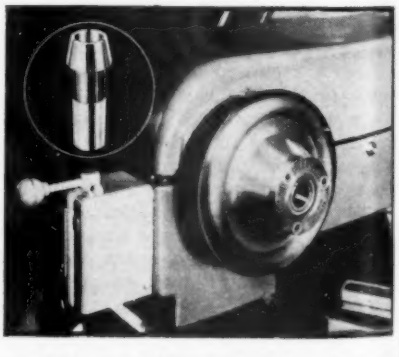
Richards Offers Terminal Head Made for Use on Thermocouples

An inclosed terminal head, the No. 2150, for use on their thermocouples for heat-treating control is offered by Arklay S. Richards Co., Inc., Newton Highlands, Mass. Inspection of the thermocouple can be made quickly by unscrewing the cover without disconnecting the leads and without interruption of production. Thermocouple wires enter the connector without bending and are easily replaced by loosening two screws.

The thermocouple tip is easily adjusted for contact with the bottom of the tube for added sensitivity, if desired. Ductile metal parts are rust and corrosion resistant. The head is furnished for ½, ¾ or 1 in. standard pipe thread. The terminal connector included in this head can be employed without the metal inclosure. It is suitable for all sizes of wire up to and including 0.1620 in. diameter.

Speedichuk and Bren Collet Increase Small Lathe Capacity

Small lathes which normally have a capacity of only ½ in. can handle collet work on stock up to ¾ in. with the Speedichuk and Bren collet made by General Die-Stamping-Tool Co., 265 Canal St., New York, N. Y. The equipment is adaptable to any lathe with a 1½ in. by 8-thread spindle nose having a No. 3 Morse taper on the inside. It can also be used on any miller or drill press for accurate chucking work. The Speedichuk requires no adapter plate. It uses a floating closing sleeve which compensates for wear and misalignment of the lathe spindle. The 6 in. handwheel



provides maximum gripping pressure on the collet with minimum effort.

The Bren collet is designed to allow use of full capacity through the spindle. It is closed by squeeze action and avoids longitudinal movement.

Information supplied by an Industrial Publication

Tool breakage—even in what was once considered "normal amounts" is something to be avoided by any means today. Replacement supplies are hard to get, and the possibility of tool shortages is too serious to permit temporizing.

In many cases breakage can probably be considerably reduced by educating operators in the proper use of cutting tools. In some instances, redesign of the tool may be the remedy.

Redesign was the solution in the case of countersink drill bits used in an aircraft factory. Bits having cylindrical pilots often broke when the center line of the bit was at an angle with that of the drilled hole. Run out in the spindle could easily cause such deflection.

The remedy suggested by an employee consisted of equipping bits with a spherical, or ball shaped, pilot. Such a pilot has the effect of making bits self aligning. Deflection through a relatively wide angle cannot concentrate enough stress at the neck of the pilot to cause breakage, because the end of the bit is not rigidly held.

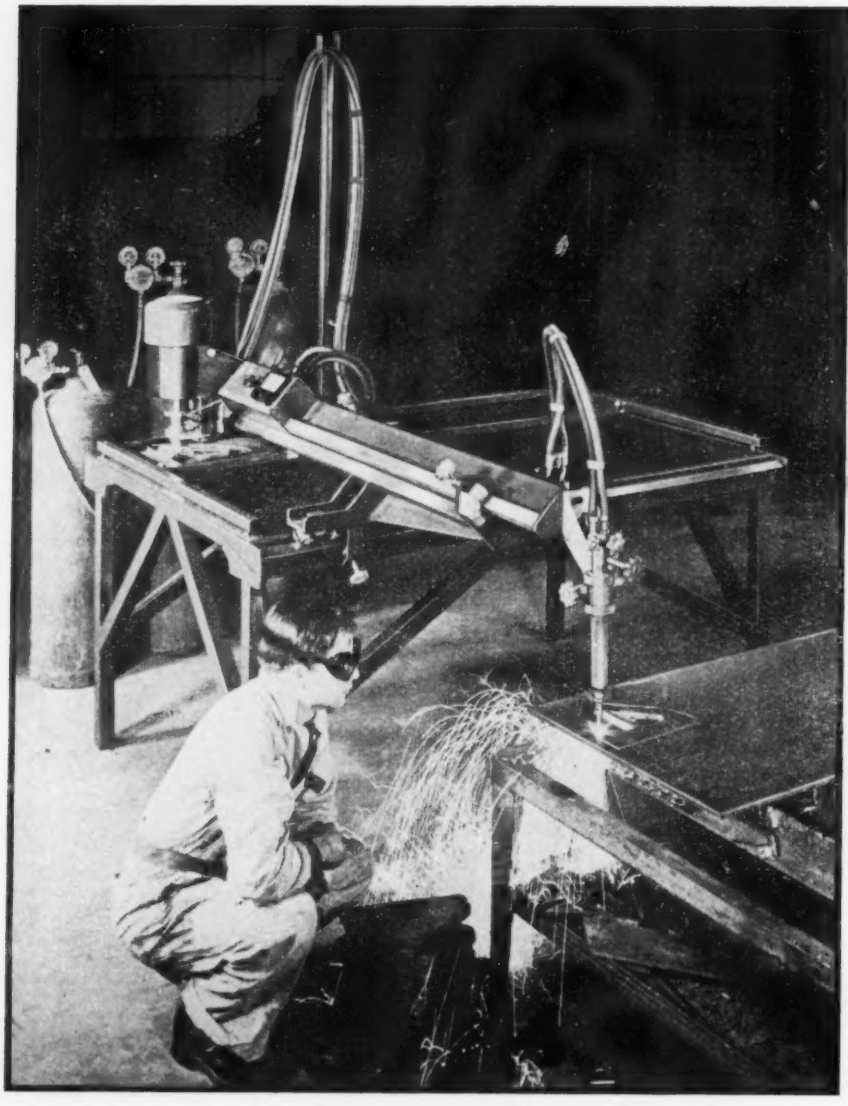
CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Mo-lyb-den-um Company
500 Fifth Avenue • New York City

MOLY



National Type JR Shape Cutting Machine Has Torch Placed at End Position on Carriage

Cutting jobs from the smallest to an over-all size of 3×4 ft. can be handled with the Type JR close-tolerance shape cutting machine made by National Cylinder Gas Co., 205 West Wacker Drive, Chicago, Ill. End positioning of the torch provides flexibility for quick, easy adjustment in relation to the end of the carriage, making it unnecessary to place the plate to the exact position on the cutting table. A handwheel provides micro-adjustment of the torch to the starting point. Uniform speed of travel is from 2 to 35 in. per min. maintained by the driving mechanism. A calibrated indicator provides for quick setting of the torch to any desired angle.

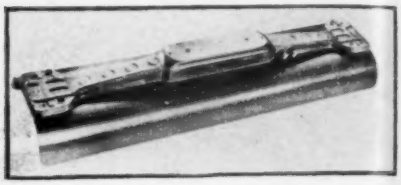
The tension and driving rollers grip the templet and follow its contour so that the shape is automatically cut out of the plate by the torch. Adjustable bar clamps hold the templet and allow it to be located at any desired spot on the machine table. The drive wheel automatically holds to any desired straight line without guidance. Finger tip control of the manual tracer allows accurate tracing of the master drawing. The templet and tracer are interchangeable in a few minutes. A swivel stop holds the templet tracer head at the correct height for templet following.

The machine is equipped with a circular cutting attachment with 6, 12, 18 and 36 in. radius rods. The electrical requirements of this machine are 115 volt, single phase a.c.

Sylvania Fluorescent Fixtures Available in Three Models

Streamline features are stressed in the industrial type fluorescent lighting fixture introduced by Sylvania Electric Products, Inc., Fluorescent Fixture Div., Ipswich, Mass. Model HS-100R using two 40 watt fluorescent lamps has an over-all length of 49¾ in., and width of 13 11/16 in., height of 6¾ in., and weighs 17 lb. The unit is available for 110-125 volts, or 220-225 volts, 60 cycle a.c. Another model has three 40 watt lamps and weighs 25 lb. The company also has available another model using two 100 watt lamps, which measures 61½ in. long, 16¾ in. wide and 8 in. high. These units are available for 110-125 volts or 220-250 volts, 60 cycle, a.c.

The ballast of these models is completely inclosed, and non-metallic reflectors are finished on the outside in gray to match the top housing. The reflector is anchored to the top housing with a pair of latches which release



with a quarter-turn. Chain hanging ears on 43 in. centers, and ½ in. knockouts on 18, 24, 30 and 36 in. centers, channel for adjustable slide-grip hangers, and knockout for pull chain switch, are provided on these lamps.

Black-Magic Blacking Process Checks Wear on Gages

Black-Magic, a low temperature one-bath blackening process, has been developed by Mitchell-Bradford Chemical Co., 2446 Main St., Bridgeport, Conn., which is useful in reducing the cost of constant checking for wear on steel gages. This process does not change the surface of the steel except to blacken it, nor are the dimensions changed even on precision gages of minute measurement.

Flows in the metal, burrs, etc. are easily detected. Another feature of Black Magic is that it prevents corrosion from perspiration and acid hands. When the bright metal shows, the predetermined tolerance is gone and the gage reuqires reprocessing. The company has available all the equipment required for operation of the process. Several tests made show that Black-Magic has a penetration depth of 0.000098 in.

By doing many things a little faster, J&L is producing more steel for war

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FROM AN ORIGINAL DRAWING BY ORISON MACPHERSON

TEAMWORK POURING STEEL BACKS UP OUR FIGHTING MEN

America's steel mills today are producing steel for war at the all-time high rate of 95 million tons a year. This averages enough steel in one second's time to make four jeeps —a dozen gun-shields.

In the illustration you see a skilled crew pouring molten steel into man-high molds to become ingots — unit measure of steel production — steel in its first solid form. The men on the platforms and the cranemen maneuvering the huge ladles from aloft, make up real All-American teams, typical of those all along the steel front of 650,000 workers who are employing all their skill and teamplay to make every second count against the enemy and toward saving American lives on the battle fronts.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

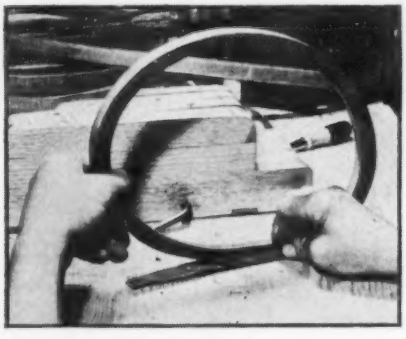
CONTROLLED QUALITY STEEL FOR WAR

J&L STEEL

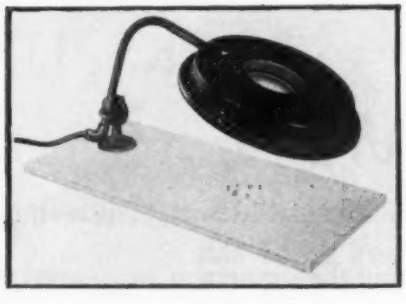
Schieren Offers Leather V-Belt Built With Flat Side Walls

Chas. A. Schieren Co., 29 Ferry St., New York, N. Y., is offering a V-belt with flat leather side walls built to a leather core. A higher friction coefficient is developed by the grip of the flat leather walls and makes slack running possible with economies of wear on both V-belts and bearings. It is said that this belt will not slip and does not promote the danger of over-heated motor bearings.

These belts are supplied in rolls. When a new belt is needed, the predetermined length is cut from a roll of the cross-section size required, and a



feather bevel is made on it with the Schieren miter box. Cement is then applied, the belt placed in a special adjustable clamp and made securely endless in a few minutes on the pulley.



Curtis Inspection Light Made With Magnifying Lens

A dust-tight inspection light, which is essentially a magnifying lens with auxiliary lighting, has been introduced by Curtis Lighting, Inc., 6135 West 65 St., Chicago, Ill. The unit consists of a steel housing 12⅝ in. in diameter and 2 in. deep, and furnished with a white Fluracite reflecting surface inside. It holds two 6-watt fluorescent lamps. All outside surfaces are finished in crackled gray.

The magnifying lens of double convex type is 4 1/32 in. in diameter. The shatterproof cover glass is lightly sanded for diffusion except for a clear spot 3¾ in. in diameter directly under the lens. The swivel base and movable arm permit adjustment of the unit for correct focusing of the object to be inspected. A cylindrical shield to reduce reflections on the upper surfaces of the lens is available as an accessory.

General Engineering Riveter Automatically Heads and Bucks

General Engineering Co., 785 Hertel Ave., Buffalo, N. Y., has developed an automatic multiple riveter known as Model G-3000, designed for mechanized riveting of a wide variety of work, including heavy-bomber assemblies. Two riveting units are mounted on ways in the lower part of the frame. They are hydraulic cylinders, each having a maximum force of 56,600 lb., each unit having a capacity for heading aluminum alloy rivets in groups of six, ¼-in. diameter, nine, 3/16-in. diameter, or fifteen, 5/32-in. diameter rivets. The riveting rams have an upward speed of 60 in. per min., and a returning speed of 120 in. per min. The total travel of the riveting rams is 6 in. The travel required during the riveting cycle is controllable over a 3-in. range in ⅛ in. steps by means of a dial mounted on the control panel.

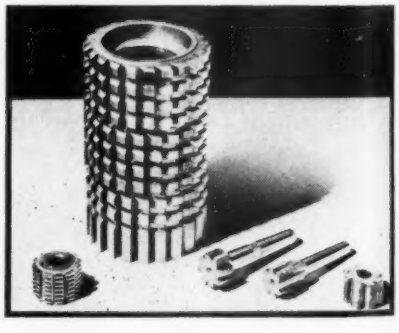
The two riveting heads may be operated together or individually. Rivets running parallel to the axis of motion, at an angle to it, or on a curve may be riveted automatically. If desired, one head of the machine can be equipped with multiple riveting anvils, and the other head with single rivet anvils for clean-up work around forgings or fittings.

Riveting force is obtained from an integrally mounted hydraulic pumping system which operates under 2,000 lb. per sq. in. A single motor operates dual, constant volume, vane type pumps, which are mounted at either end of the drive shafts. The dual solenoid-operated valves make it possible to control either riveting heads separately, or both heads at one time.

Bucking units are mounted on tracks in the upper frame opposite the riveting units. The rams may be raised a total of 6 in., at a speed of 30 in. per min. Operation is by geared motor with automatic brake.

The two feed rolls are motorized with geared head, integral brake motor, and may run in either direction by backward or forward movement of the control handle, or they can be operated from stops on master control bars. Mechanical feed rate is 60 in. per min.

Both the riveting units and bucking units have 6 in. total stroke, 2 in. of which overlaps to provide for compensation in riveting level. This leaves a clear opening of 4 in. above and 4 in below the center between anvils, or a total of 8 in. Turntables are provided so that the anvils can be rotated 300 deg. and locked in any position. Longitudinal feed rolls, transverse positioning of the anvils, complete riveting cycle, or partial cycle can be controlled individually. Any of these operations may be interlocked by selector switches so that complete automatic operation or semi-automatic operation is possible. The riveter can be easily changed from automatic to manual control.



Plan-O-Mill Milling Cutters Made in Complete Size Range

A line of multiple thread milling cutters in National, Whitworth, Acme, V, and special forms is being made by Plan-O-Mill Corp., Hazel Park, Mich., with straight or spiral flutes, with or without special tooth for the removal of imperfect thread. The cutters are offered in a complete range of sizes. They are ground or unground, and for use on any type of thread milling machine.

rub your desk . . .

meet Enemy No. 1

Rub your thumb along your desk—*fast, hard!* . . . Feel the resistance—the heat? When you fight a mechanized war, *that's* the *first* enemy you have to lick—*friction!* . . . *Everywhere* the fight against friction is waged *without let-up.* It is a fight that *must be won* before we can even get at our enemies! . . . Perhaps no other single item plays so vital a part in the kind of war we fight today as the ball bearing. Without it, not a wheel would *keep* rolling—not a ship would *keep* sailing—not a plane would *keep* flying. New Departure ball bearings are helping to keep America's war machine rolling, sailing, flying on to victory.

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Nothing rolls like a ball

New Departure

THE FORGED STEEL BEARING

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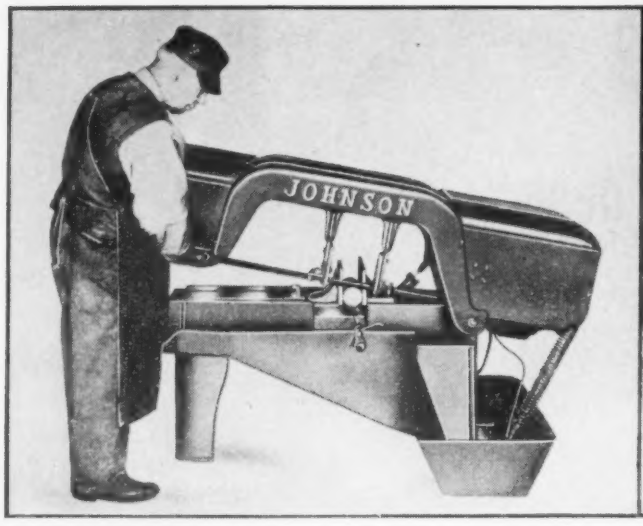
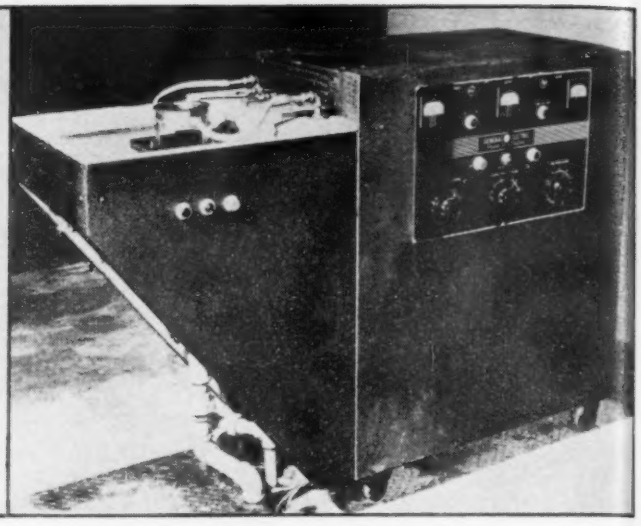
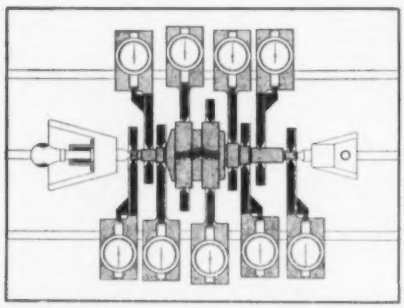




Johnson Makes Metal Saw In a Wet Cutting Model

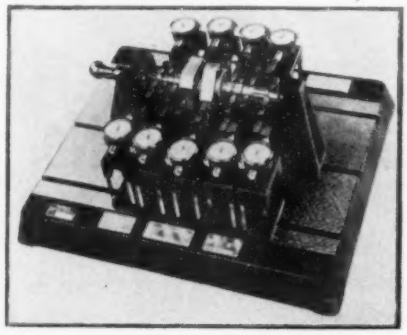
A wet-cutting metal saw has been made available by Johnson Manufacturing Corp., Albion, Mich., equipped with a non-clogging piston-type pump which is driven by a noiseless cam, and mounted in the frame of the machine. No additional power is required as it is taken from the present drive gear, eliminating the necessity of a separate motor. The speed of the pump is automatically regulated by the speed of the machine, automatically stopping and starting with the machine. A steady flow of the coolant is in direct relation to the blade speed. For dry cutting, the pump can be readily disconnected.



Federal Makes Inspection Gages To Check Parts Simultaneously

Three models of multiple inspection gages have been introduced by Federal Products Corp., 1144 Eddy St., Providence, R. I., which operate mechanically and require no electrical connection. Illustrated is Model 236 B-123 which is designed to check simultaneously the various diameters of a rotor shaft. It is adjustable to take any length of shaft up to 12 in. long, and can be furnished with gaging units to accommodate any diameter up to 4 in. The shaft is mounted between centers so that it can be rotated. The gaging units and the brackets housing the centers slide in T-slots in the base. They can be moved longitudinally and locked in any position by a T-bolt. The indicator is graduated to 0.0001 in. and has a range of 0.025 in.

The part is held accurately between the centers under spring pressure. It is removed by pulling the knob at the left-hand end of the gage. Each gaging unit, consisting of a dial indicator, a sensitive contact and fixed contact, checks each diameter independently of the other. This unit is mounted on stiff springs and moves transversely.



The movement of the sensitive contact is transferred directly to the indicator point by a pantograph unit. This unit also provides a convenient means for adjusting the contact to a master.

Another type of gage, Model 247 B-72, checks simultaneously ten dimensions on a cylinder sleeve, eight diameters and two lengths. Each indicator operates as an individual unit.

Five separate dimensions on a fuze body can be checked in one operation on the Model 247 B-76, thickness, height and distance. The gage stands upright so that the dials face the operator as he sits at the bench, and is portable from one bench to another. This gage must first be set to a master. The fuze body is positioned in the gage by placing it on three supporting blocks in such a position that the narrow shoulder on the under side of the body contacts the front surface of a block. The indicator is graduated to 0.0005 in. and has a range of 0.075 in. The movement of each sensitive contact on this model also is transmitted directly to each dial indicator point through a pantograph unit.

G. E. Makes Electronic Heater For Induction Heating of Parts

For high frequency induction heating of metal parts for brazing, soldering and selective heat-treating, General Electric Co., Industrial Heating Div., Schenectady, N. Y., has introduced an electronic heater available in two standard sizes, one having an output of 5 kw., and the other of 15 kw. They are essentially power oscillators which convert 60-cycle power to high-frequency power at approximately 500,000 cycles.

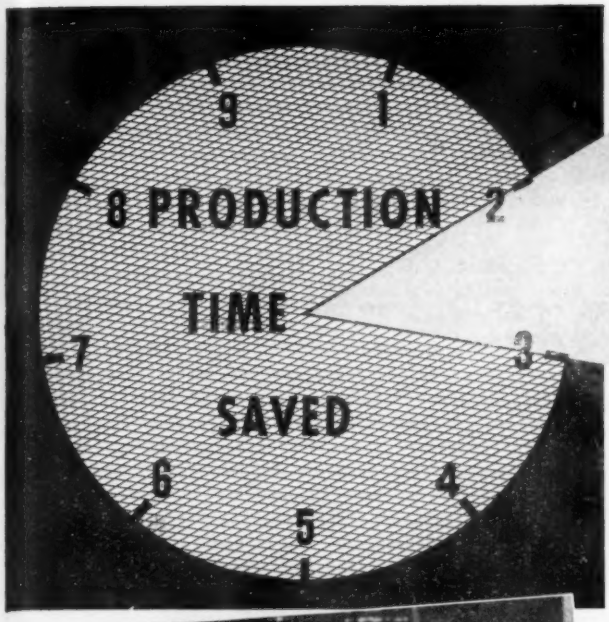
A suitable work table is attached to the electronic heater with the water-cooled coil or coils connected to the heater terminals. These coils can be fabricated easily in different shapes, depending on the work to be done.

With the inductor coil connected to the terminals of the oscillator and the timer set, the filament switch is turned on to operate the equipment. Next the predetermined transformer tap on the dial switch is selected, and the grid rheostat set. The operator then turns the selector switch for automatic operation, and repeats heat after heat by locating the piece in the inductor coil and initiating the automatic cycle by operating a pushbutton.

The line voltage is stepped up by a power transformer, and rectified to direct current. The direct current supplies the oscillator circuit, which consists of grid-controlled vacuum tubes shunted across a parallel resonant circuit. The heater coil is connected in series with the parallel resonant inductance by means of convenient connectors, taps being provided to give flexibility in obtaining maximum efficiency for the various heater coils. Automatic timing of heating cycles is provided by a timer in the oscillator.

Hammond 600 Belt Grinder Provides Wet or Dry Operation

Improvements have been made in the 6 in. Wet-N-Dry abrasive belt grinder made by Hammond Machinery Builders, Inc., 1618 Douglas Ave., Kalamazoo, Mich. It has a heavy, large cast base



Production Increased 800%

The height of the stack of eight wheels, in the lower picture, compared to the height of the one wheel, shows the *relative* increase in the number of these wheels finished per day, now and formerly. The operation consists of turning the outside diameter, from rim to rim. Formerly, this was done on standard lathes. By putting the job on Monarch-Keller lathes, with electric controls, production was increased 800%. By this method, a thin metal template is drawn over an electrically controlled tracer, and the cutting tool *automatically* follows the specified contour, thus permitting greatly increased speed and accuracy of production.

Monarch-Keller lathes are similarly increasing production of many and varied kinds of war work. If we can help you select the right tool for the right job, we'll gladly work with you.

THE MONARCH MACHINE TOOL CO. · · · SIDNEY · OHIO

MONARCH LATHES *Save Time*

Photographs by courtesy of Hayes Industries, Inc.

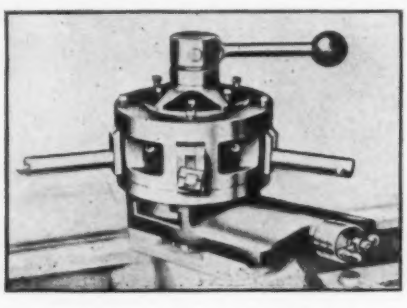
and sludge pan and pulley-motor mountings which are easily adjusted from outside of the base. The machine can be adjusted from vertical to horizontal position while it is running. Likewise the belt tension and tracking device can be adjusted by two conveniently located handles. This Hammond 600 machine provides wet operation for grinding, polishing or surfacing.

The machine is totally inclosed, and arranged for individual dust collector or for connection to an exhaust sys-

tem. The abrasive belt pulleys are made of cast iron and dynamically balanced, and run on dustproof ball bearings. The work table can be adjusted to any desired angle and is available as a bench or floor model. It is equipped with a tank and pump unit, and may also be equipped for water-main connection only. A damper or spray control and two nozzles are provided for uniform spraying. When dry operation is desired on the machine, it is only necessary to turn off the water, remove the drain connection, and attach the air exhaust system at this point.

Automatic Toolblock Turret Permits Five-Station Set-Ups

The five-station oscillating tool block lathe turret made by Automatic Machine & Tool Co., 132 Charles St., Auburndale, Mass., allows for the set-up of five separate operations, and the possibility for indexing in ten positions. It is available for four lathe sizes with outside turret diameter of 4¾, 6⅝, 7⅝

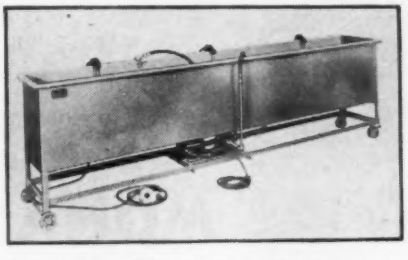


and 9½ in. The turret heads are supplied with five holders and hardened clamping pieces together with dowel pins. Reducing bushings and toolbit bushings are interchangeable in these holders for any given size. They are supplied as extra equipment.

To change from one station to the other, it is only necessary to turn the handle one-eighth of a turn. The handle is lifted to a 45 deg. position and turned to the next tool position desired in the turret head. To tighten, the handle is moved back again to a horizontal position, and pulled up with one-eighth of a turn. A setscrew is located each side of the center pin which acts to oscillate the block, at the same time to tighten a toolholder rigidly in this assembly. The tool may be readily centered by screwing down one screw and screwing up the other. The rake angle of a toolbit can be easily changed by the rotation of the sleeve in the holder.

Circo Portable Cleaners Hold Two Sizes of Cannon

Portable cannon cleaners are being offered by Circo Products Co., 2835 Chester Ave., Cleveland, Ohio, in two sizes. Model 37-mm. which is 108×18 and 22½ in. deep, has two electrical immersion heating units. Any cleaning solvent or compound may be used, hot or cold. The cleaning liquid volume is



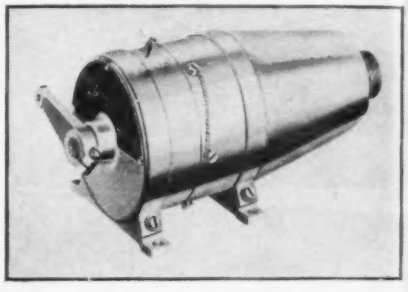
controlled at the flusher handle without stopping the motor. The heating units are theremostatically controlled, and one or both heaters can be removed when heat is not required. The cannon is placed on the work screen in the tank, and a switch operates the pump which provides a constant flow of cleaning liquids. Capacity of this model is 20 gal.

The Model 57-mm. is equipped with three electric heating units, also thermostatically controlled for correct operating temperature. This machine measures 119×18 in. and is 22½ in. deep. It has a capacity of 25 gal. Both cleaners are furnished with a ¼ hp., 115-volt, 60-cycle, single-phase, a.c. motor.

Barber-Colman Control Motor Designed for Aircraft Use

A control motor has been brought out by Barber-Colman Co., Rockford, Ill., which is used for the control of dampers, in governing cabin temperatures, flow of air through supercharging, intercooling equipment, and airplane engine cowl flaps. It is used also to drive valve mechanisms on various types of lines carrying water, steam, gasoline, anti-freeze mixtures, as well as for the operation of gasoline dump valves and cabin pressure regulating valves. The unit weighs 3 lb.

The motor is designed for low temperatures, high altitude operation. It is housed in an aluminum case, and is available with or without mounting brackets and with a connector plug mounted on the end. Totally inclosed tamperproof limit switches are set for 90 to 180 deg. rotation. Motors are



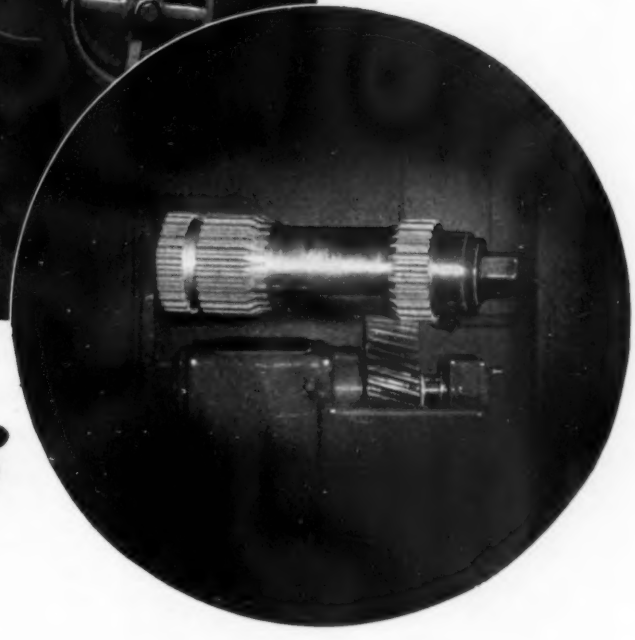
available for positive, floating or proportioning control as a unit of the Barber-Colman Micro system, or for step control by manual or automatic means and for remote position indication.

Reps Heavy-Duty Extractors Remove Pipe and Tube Stub Ends

Heavy-duty extractors for removing stub ends of pipes, nipples, tubes, bolts or screws have been introduced by Reps Tool Co., Inc., 99 Wall St., New York, N. Y., made up in ten different sizes to fit every diameter and type of pipe or tube from ⅛ to 2 in., and studs, screws or bolts from ⅜ to 3½ in. A set of ten is supplied in a special wooden case with a selector plate.

These double-purpose extractors are forged tool steel with heavy square shank followed by a sharply tapered, short, reverse thread, ending in a square reaming end. A four-point grip is obtained quickly by inserting the tapered end in the stub of pipe or drilled screw or bolt without any ham-

..as for Aircraft



Shaved Gears

FOR TANKS

Widely regarded as a "pilot" plant in the production of specialized precision gears for tanks is the Mack Manufacturing Company.

Even though the accuracies and finish required in gears for such vehicles far exeed normal requirements–Mack is doing an outstanding job in producing such gears by mass production methods, employing Michigan gear shaving, gear lapping and gear checking equipment.

Finished on the Michigan 860 rotary machines at Mack are both shaper cut and hobbed gears as well as involute splines.

It makes no difference to a precision gear shaver whether the gear it finishes is for a tank, for a boat or for an aircraft engine.

Ask for the new 32-page Gear Finishing manual GF-43

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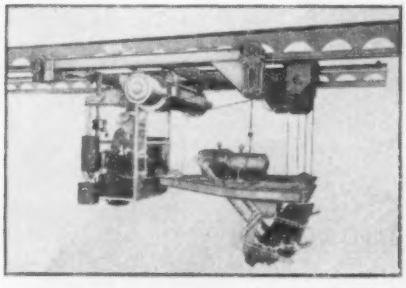
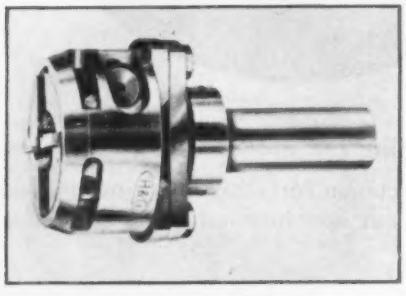
mering or other preparatory steps. The built-in square reamer automatically removes burrs. Continued increased pressure of a wrench on the squared shank pulls the broken piece outward on its threads.

Cleveland Pipe and Rod Carrier Handles 12 Ft. Stock Lengths

A motor-driven pipe and rod carrier has been produced by Cleveland Crane & Engineering Co., Cleveland Tramrail Div., Wickliffe, Ohio, which permits the cab operator to pick up 1,500 lb. of stock in 12-ft. lengths. This carrier provides a saving in floor space. Materials transported need not be in balance nor is it necessary for the operator to spend time in locating the center of gravity of the load. The pick-up fork assembly has a three-point rope suspension from the carrier which gives it the necessary rigidity for handling loads that are considerably off balance.



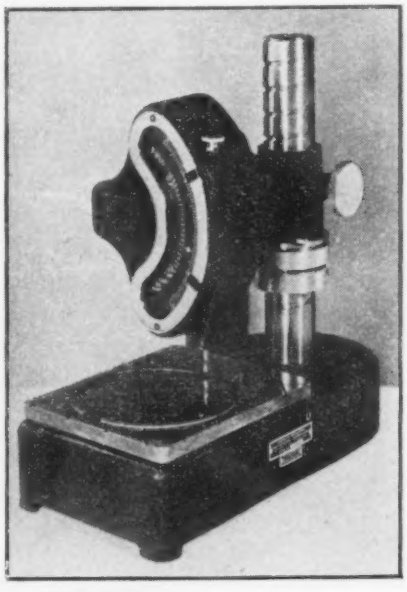
Stability is also provided in the double overhead track system on which the carrier travels. Two forks, operated by a motor-driven crank, tilt upward when loading or downward when unloading the rod and pipe. A limit switch automatically stops the fork in the upward or holding position when the fork mechanism is not in operation. The fork assembly can be raised or lowered as required. This unit has an 8 ft. lift, but others can be furnished for lifts of 20 ft. or more if required. Hoisting speed is 20 ft. per min. and carrier travel speed is 300 ft. per min.



Eastern Adjustable Dieheads Fit All B. & S. Screw Machines

Style SAML solid adjustable insert-chaser dieheads have been introduced by Eastern Machine Screw Corp. Truman and Barclay Sts., New Haven, Conn., in sizes ranging from 0 to 1¼ in. and suitable for cutting thread lengths from 1 3/16 to 1 7/16 in. These dieheads have been developed for use on all sizes of Brown & Sharpe automatic screw machines. By bushing the shank, the heads may be used on larger machines. The No. 00 size and the 1 1/32 to 1¼ in. size are slabbel slightly on one side to clear the machine for which they are designed. These dieheads are provided with an alignment feature to take care of misalignment of the turret and spindle, and are complete with holders.

The same H&G insert chasers are used in these heads as those in the H&G opening heads or other styles of solid adjustable heads where the range is the same. The chasers are easily removable for regrinding. These dieheads are light in weight, relatively small in diameter, and short.



Amic Comparator Has Table For Measuring Large Parts

American Measuring Instruments Corp., 240 West 40 St., New York, N. Y., has brought out the Amic comparator on a cast iron base into which is built a ground, lapped and serrated 6½×8-in. table for measuring the width of piston rings and other parts of large area. A displacement of the measuring pin of 0.001 in. causes the indicating hand to move 1 in. on the 6 in. dial, which has inch and millimeter readings. Each inch is divided into tenths. Total measuring capacity of the comparator is ± 0.003 in. and ± 0.05 mm. A lever is provided on the outside of the housing to permit lifting of the measuring pin before inserting the piece to be measured, thereby eliminating shocks to the mechanism and wear on the contact pin.

The columns have a double nut adjustment, one coarse and one fine, for accurate setting of the comparator by means of a master gage or Johannson block. A final adjustment of the dial is provided for additional convenience in final setting. Two limit hands in the form of sliders serve to indicate the range of tolerance requirements.

Ful-Vue Safety Goggle Made for Women Workers

A Ful-Vue safety goggle for women workers is offered by American Optical Co., Southbridge, Mass. It has clear super armorplate lenses and is made in 42 mm. eye size. Three bridge sizes of this F3142 goggle, 19, 21 and 23 mm. are available.

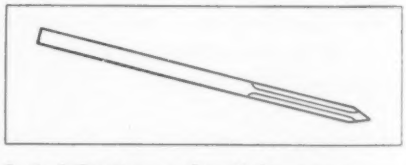
A sturdy, double-bracked bridge is designed for long life under hard usage. The earpieces have perspiration-proof insulation. The lenses are deep curved for extra strength, and are optically ground and polished.

Alrose Oxidine Black Finishes Available for Various Metals

Oxidine finishes have been developed by Alrose Chemical Co., 180 Mill St., Cranston, R. I., for black finishing various kinds of metal. For use on alloys such as brass and electroplated copper and brass, Oxidline B provides a hard black finish. The salts are merely added to water, heated to 200 F. and the blackening is obtained by immersion in the bath for a few minutes, depending on the alloy.

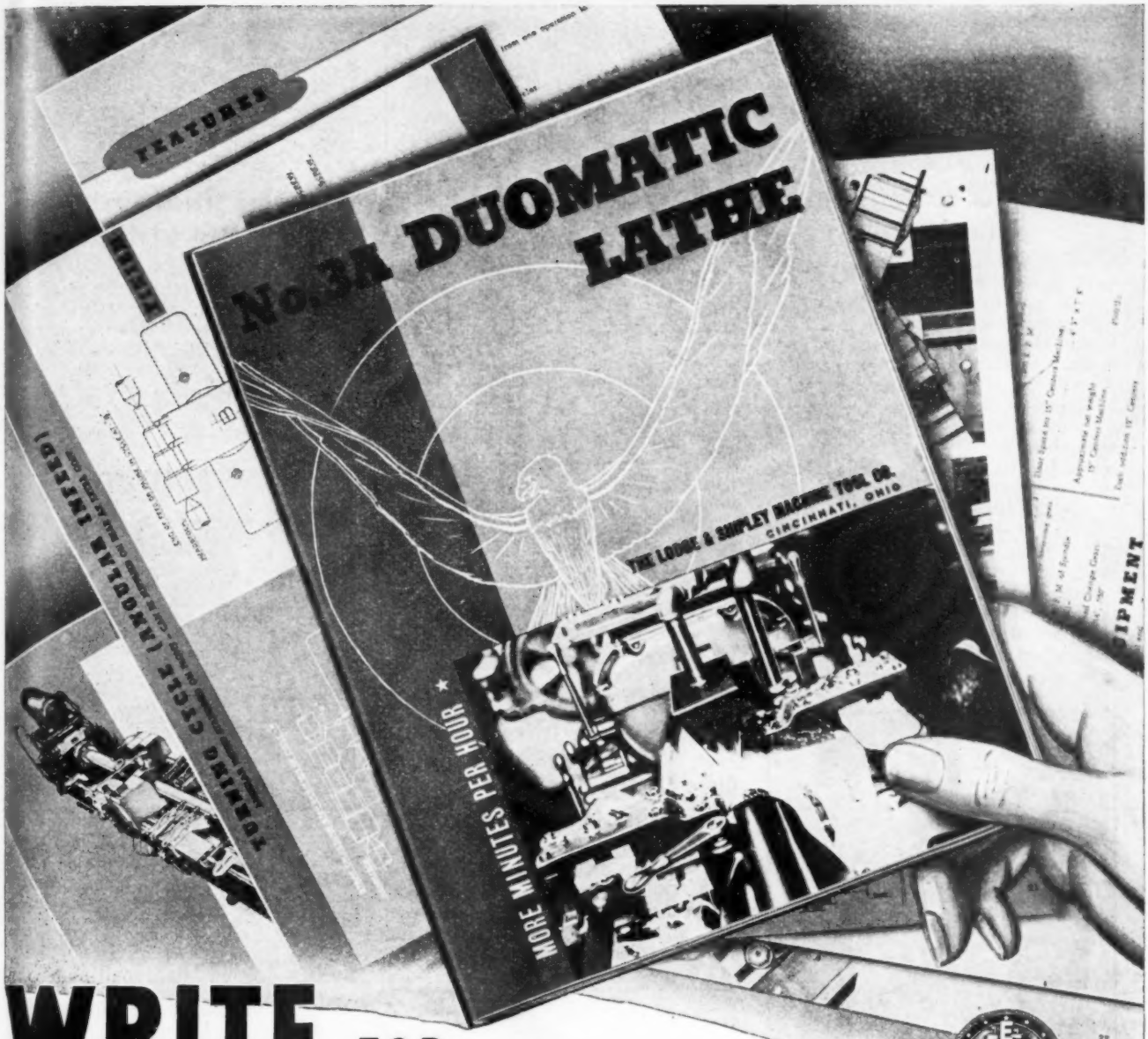
Oxidine Z is recommended for use on zinc die-castings and electroplated zinc. The salts are heated to the boiling point and objects are immersed from ½ to 2 min., forming a smooth adherent black surface.

For obtaining a dense black finish at low temperature on cast iron, Oxidine CI salts are added to water and heated to 212 deg. F., and the cast-iron parts immersed for 5 to 10 min.



L & I Produces Small Reamers With Ground Straight Flutes

Small Hi-Speed reamers with ground flutes are available from Lavalle & Ide, Inc., Chicopee, Mass. These straight flutes with straight shanks are produced from centerless ground, steel stock, and are made in diameters from 1/16 to ¼ in., with special sizes and dimensions supplied on order. The



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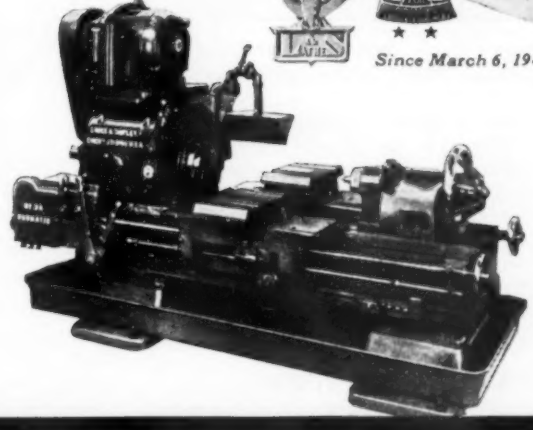

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ENGINE TOOL ROOM AUTOMATIC LATHES

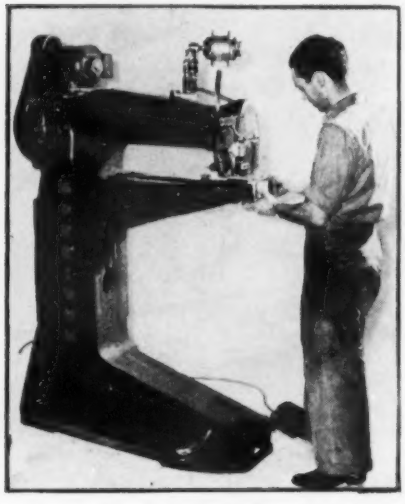
flute lengths vary from 1 in. up to 1½ in., and over-all lengths range from 2½ to 6 in.

The flutes are ground after the hardening operation and lapped, which process is said to eliminate the distortion of the flute structure, and results in a keen cutting edge.

Morrison Metal Stitcher Fastens Material to Metal

Stitching of aluminum alloys, stainless steel, and the combining of these metals with other materials such as rubber and asbestos can be performed on the Morrison aircraft metal stitcher made by Harris-Seybold-Potter Co., Seybold Div., Dayton, Ohio. Any combinations of the material can be handled in thickness up to ¾ in. The machine forms a wire stitch 7/16 in. inside the legs. A minimum of ⅛ in. spacing can be made between centers of parallel stitching. The stitcher occupies a floor space 21×44 in., and is 45 in. high from the stitch to the floor, and weighs 1,375 lb.

The operator holds the work in position, depresses a pedal, and the machine forms its own stitch, drives and clinches it. The pedal may be moved to suit the operator's convenience. The

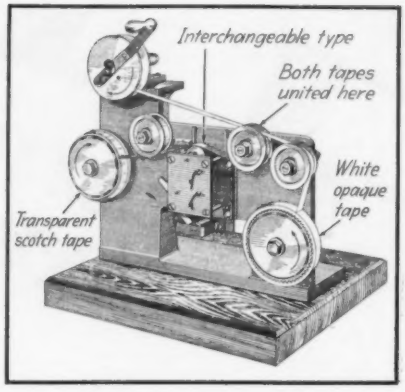


25-in. space between the head and pedestal allows ample room for large sheets or assemblies.

The faceplate assembly projects 1 in. in front of the line of stitch, giving maximum working space. Automatic air blast is provided to expel slugs. A wire spool bracket requires no readjusting of the spool tension when changing. A safety switch to disconnect the treadle prevents accidental tripping of the machine while it is running.

York Scotch Tape Printer Marks Symbols on Parts

For marking codes and symbols on parts, a machine has been developed by York Electric Machine Co., 1241 West King St., York, Pa., to print Scotch tape in a manner which makes it impervious to gasoline and oil. The



printed surface is guarded against friction, and it will not scrape or rub off. New codes and symbol markings may be had in a few minutes with this small portable printer. Interchangeable type and numeral wheels permit unlimited alphabet or digit combinations.

The printing is on the under or sticky side of the transparent tape, and the transparency is then backed up with an opaque tape. This results in a hermetically sealed ink in between the tapes. Each model is furnished with three printing wheels, each having one character. A half-inch tape will carry four characters. The tape printer is available in five models with tape ½ to 1½ in. wide.

Circo Electric Grease Dip Tank Suited for Rustproofing Guns

A grease dip unit, introduced by Circo Products Co., 2835 Chester Ave., Cleveland, Ohio, is known as the Model 20MM-Jr. It is suited for rustproofing guns and other parts for shipping and storage. The unit is equipped with

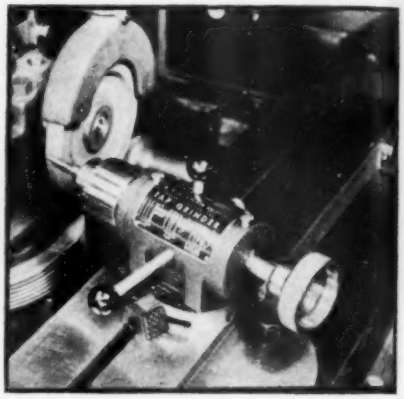
a calibrated temperature adjusting thermostat with range from 60 to 250 F. to control the electrical heating elements, which are equally spaced in the tank to provide proper heat distribution.

The inside dimensions of the grease dip are 102 in. long, 10 in. wide, and 12 in. deep, including a 2-in. high-heating element protecting and work rest screens. It is 30 in. high over-all including 4 in. swivel casters. The drain pan is welded to brackets so that the pan and bracket assembly can be taken off by merely removing wing nuts. Liquid capacity to the 8 in. tank level is 35 gal. The work capacity is approximately 460 lb. of steel per hr. raised to 180 F. Shipping weight is 575 lb.

Reading Tap Grinder Attachment Fits Most Grinding Machines

An attachment suitable for use on any type of flat table grinder, on tool, cutter, surface and cylindrical grinders, and bench lathes is the tap grinder brought out by Reading Machine Co., Reading, Ohio. Dull taps can be resharpened quickly with this attachment.

The grinder has a built-in chamfer

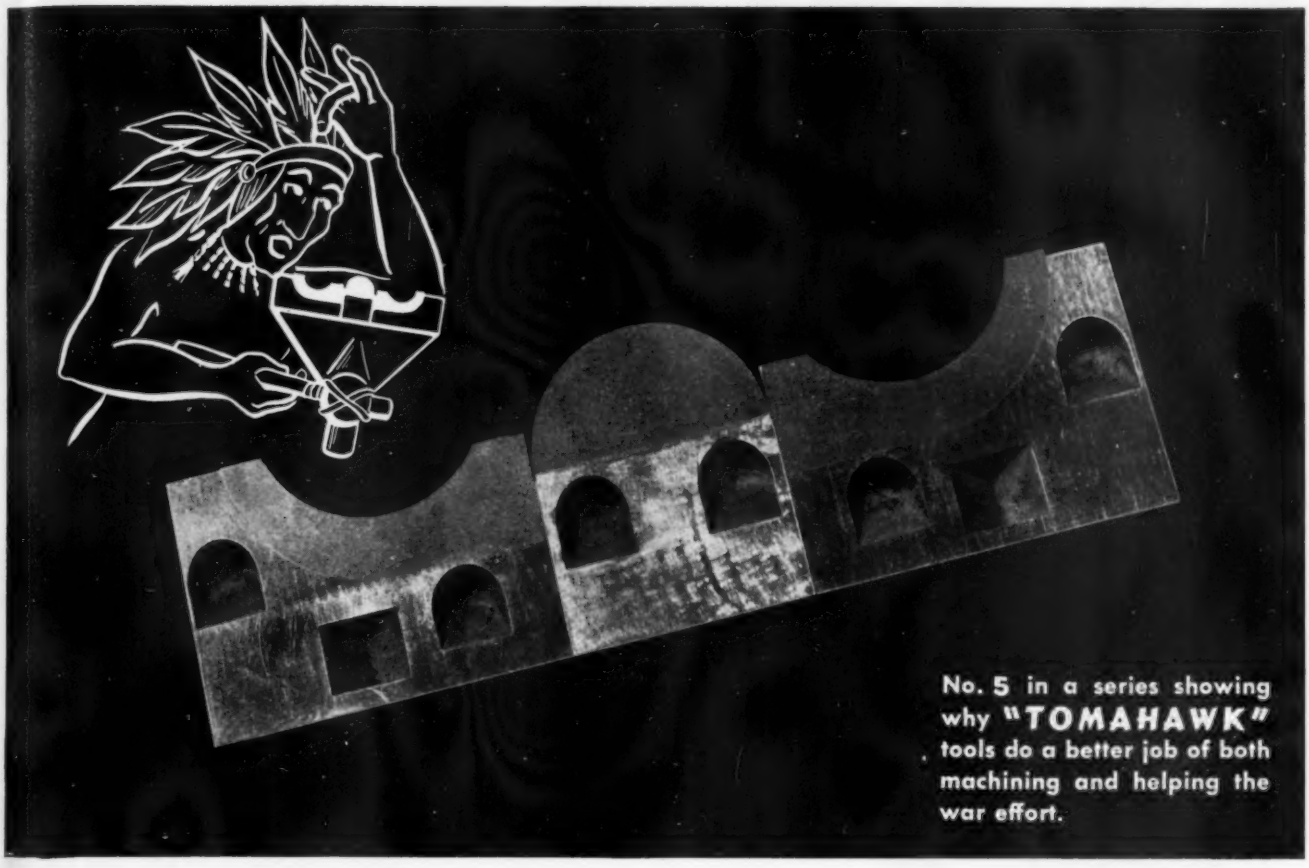


protractor and a shifter for two, three and four flute taps. A variable relief through-adjustment screw provides positive locking. The equipment has a capacity to ¾ in. hand tap.

Barber-Colman Micropositioner Developed for Aircraft Use

The micropositioner has been developed by Barber-Colman Co., Rockford, Ill., for aircraft applications, and is used for remote positioning of control motors, control of air valves and other aircraft installations. It is a polarized direct-current voltage sensitive relay.

The contact tongue of this equipment is positioned by means of a balanced armature. The construction reduces to a minimum the effect of vibration. The



Something Indians didn't know about "TOMAHAWKS"

One big three-piece carbide tipped **"TOMAHAWK"** form tool like this may save several times its weight in precious tungsten in the form of high speed tools of shorter life.

Splitting the 10 inches of total length of carbide tip into 3 sections also simplifies and speeds manufacture, simplifies sharpening and set-up, increases overall tool life and reduces replacement cost in case of damage.

Size of a tool in itself is no bar to the efficient use of carbides. Genesee will be glad to advise you as to the desirability of tipping big as well as small tools with carbides.

GENESEE TOOL COMPANY

FENTON, MICHIGAN

* Registered Trade Mark

operating mechanism is mounted on a Bakelite base, and inclosed in a transparent case which affords convenient contact inspection without the removal of the cover. Contact rating is 0.5 amp. at 28 volts, and sensitivity is 0.10 volts, 0.002 amp. The micropositioner weighs 6 oz. The contacts are single-pole, double-throw with floating position. Dimensions of this unit are $2\frac{7}{16} \times \frac{7}{8} \times 1\frac{7}{16}$ in.

Hall Binrack Bench Bins Have Convenient Feed Tilt

Binrack standard bench bins developed by Gordon L. Hall Co., Old Lyme, Conn., are designed for use directly on the bench and require no racks. These bins ranging in width from 2 to 8 in., with capacities of ½ to 2 pt., are raised

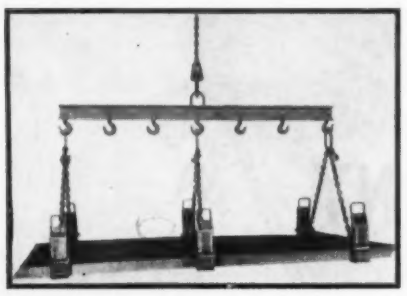
at the back, giving the proper forward tilt for gravity feed of parts toward the front. Folded edges are provided at the front so that the hands will not contact sharp metal. These bins are finished in olive green.

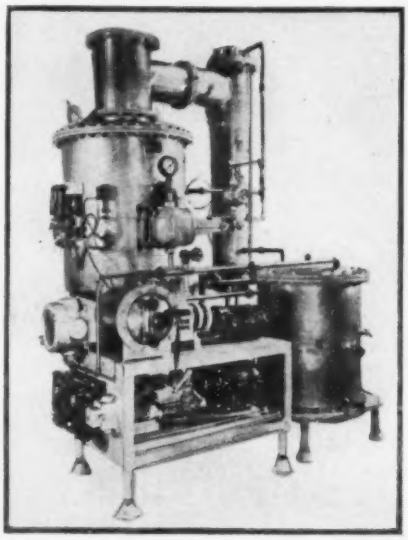
Bench hopper bins can be furnished in 4- and 8-in. widths. All sizes are 7¼ in. long.

Palmer-Shile Sheet Steel Grab Holds Short or Long Bundles

For handling short or long flexible bundles of sheet steel, Palmer-Shile Co., 780 South Harrington Ave., Detroit, Mich., has introduced a grab which holds the bundles without slipping.

A single grab is used for short bundles, two grabs hooked to a supporting beam for medium bundles, and three grabs for the longer units. The supporting beam is 6 ft. long, and lifting capacity ranges up to three tons. The sizes of bundles may vary from 18 to 48 in. in width, up to 9 in. in thickness, and any length. A grab hook takes up the slack in the chain when low headroom requires. The complete unit weighs 190 lb.

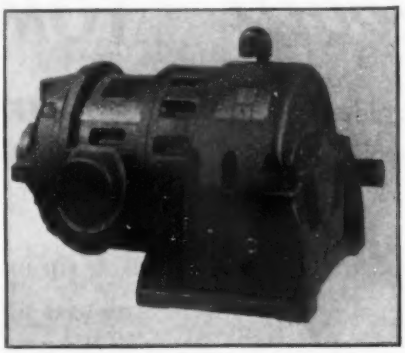




Brighton Solvent Still Is Made Explosion-Proof

A recent development of the Brighton Copper Works, 2151 Colerain Ave., Cincinnati, Ohio, is an automatic solvent still for use in reclaiming solvents. The unit is explosion-proof and is suited for handling all common type solvents.

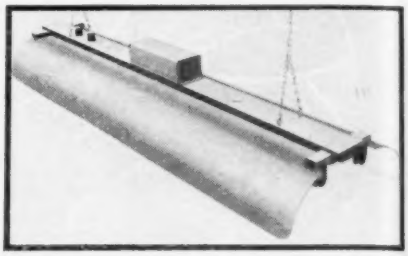
A separate vacuum pump is provided whose action reduces the boiling point. This still is available in capacities to meet specific requirements.



Westinghouse Gearmotors Are Horizontal Shaft Type

A line of horizontal parallel shaft type gearmotors brought out by Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., meets speed reduction requirements for a wide variety of industrial applications over a range of 1 to 75 hp. The use of adaptor castings between the motor and mechanical parts allows the use of all standard Westinghouse N.E.M.A. frame motors with each type of unit. The design of motor-adaptor assembly being common between unit types, such assembly can be readily shifted between unit types to meet changes in speed requirements.

Gears and pinions in this line of gearmotors are of 0.40-0.50 carbon steel, and are given special heat-treatment before hobbing. The gears and bearings are lubricated by a positive splash system, and the case design allows oil to circulate freely at all times. This unit also features compactness and improved foundation stability through heavy exterior ribbing of the housing at each mounting hole.



Martin-Gibson Lighting Fixture Is Equipped With Spacing Unit

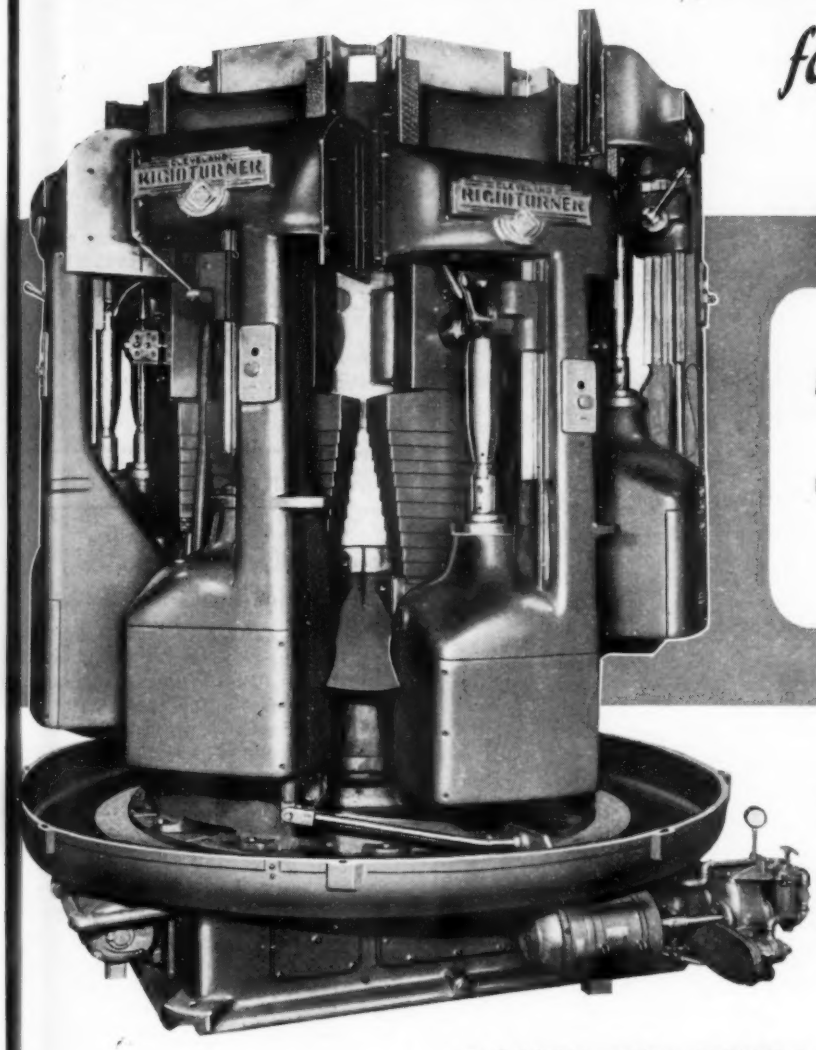
Martin-Gibson Co., 999 Harper Ave., Detroit, Mich., has available the 5000 Line of industrial fluorescent lighting fixtures which features the Flexi-Coupler, a device which permits spacing of fixture units as far apart as 6 in. All features of the continuous-run installation have been preserved, however. The fixture has lightweight channels, and a high reflection factor is provided in the non-metallic reflectors. The unit is available in two 40-watt, three 40-watt and two 100-watt sizes.

Union Drop-Bottom Dump Box Developed for Fork Truck Use

For use with fork trucks, Union Metal Manufacturing Co., Canton, Ohio, has brought out a drop-bottom dump skid box of all-steel which is attached to a skid platform with a continuous hinge at one end. Steel plates are welded to the skid at a point equal to the length of the fork or platform on the power truck to hold the skid in position at the end of the fork and prevent it from sliding back as the forks are lowered. Latch rings are attached to the top rear of the box and

RIGIDTURNER

for Maximum Output of 105 mm Shell



MULLINS MANUFACTURING CORPORATION
reports production per hour exceeded expectations

THIS IS TYPICAL

of the results accomplished with Rigidturners on all types of duplicate turning of multiple diameters.

SAVES ON BOTH SHORT AND LONG RUNS

Simplicity of changeover makes low production jobs profitable. Long cutter life and minimum down time shows sizeable savings on high production jobs.

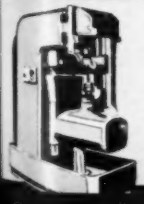
Production today — Economy tomorrow

Today it's precise and high production that is paramount—tomorrow the same exacting precision at costs permitting profitable operation on work that will be sold in competitive markets,— will be the deciding factor.

The Rigidturner meets today's high production needs and anticipates tomorrow's economies with rigidity of construction and a unique method of duplication of multiple diameters.

Consult a C. H. Engineer on your duplicate turning work.

THIS BULLETIN
tells all about the Rigidturner —what it will do—how it works —and how it can cut your costs for turning multiple diameter work. Write for yours today.



The CLEVELAND HOBBING
Cleveland ... MACHINE Company ... Ohio

WOODY SPENCER SAYS:—

"REMEMBER THESE RULES WHEN TAPPING SPECIAL MATERIALS"

No. 4 in a series of WOOD & SPENCER "KNOW HOW" messages.

For best results, select the tap best suited to the material . . . and use it correctly!

These simple rules will aid you

1. In bakelite, hard rubber, fibre, etc., do not put much strain on taps. Use high-speed-steel taps specially treated for abrasion resistance.

2. Avoid advancing the tap too fast when cutting threads in soft material. Spiral point taps are apt to cut too freely. If the tap advances too fast when it enters, that portion of the threaded hole will be bell-mouthed.

3. Be sure that the rake of the cutting edge is correct for the material that you are tapping.

4. Tap breakage is to be expected if you use too coarse pitches in tough materials.

These rules applied to your work will result in more and better production . . . production that is vitally important to all of us in our concentrated war-effort. And when next you have a tap-use or selection problem let us solve it . . . from customers blueprints we quite frequently make recommendations for

"THE RIGHT TAP AT THE RIGHT TIME"

The Wood & Spencer Company

Cleveland, Ohio

hooked over a plate welded to the truck mast.

In operation, the skid portion is entered with forks or platform of trucks, the box elevated and the latch rings attached. The skid portion goes down as the forks are lowered, while the box portion goes up and the contents of the box dumped in front of the unit. Spot dumping of materials is accomplished by the side plates which form a chute to prevent the contents from spilling out of the sides during the dumping cycle. These side plates may be extended up to the box top and a crane loop welded to each plate, allowing the unit to be handled by a crane for transporting. The drop-bottom dump skid box may also be used as a standard skid box for unit load transportation, or handled by hand lift trucks.

NEW MATERIALS

Pluswood Alloy Wood Material Useful for Gears and Bushings

Among the many uses for Pluswood, which is being offered by Pluswood, Inc., Oshkosh, Wis., are gears, bushings and tool handles. The material has a wood grain with a high, permanent gloss finish and weighs about one-half as much as aluminum. The characteristics of this "alloy wood" are comparable to metal and require metal-working tools to handle it. Physical properties of Pluswood include specific gravity of 1.3 to 1.4, volume of 20 cu.in. per lb. and tensile strength of 32,000 to 40,000 lb. per sq.in., and tests show no failure in dielectric strength to 86,000 volts per in. (parallel to lamination at 50 C.).

This material is said to be unaffected by extremes of temperature and is impervious to mild acids and will not support combustion. It is a resin-impregnated plywood heated by high electro-static frequency waves, and is simultaneously compressed under heavy pressure. Where fire-retardant salts are impregnated with the heat-treating resin, Pluswood is highly resistant to fire. Because it is extremely dense, it is difficult to scratch and it is also highly resistant to swelling or shrinking.

TRADE PUBLICATIONS

ABSENTEEISM The experiences of management in dealing with absenteeism constitute pamphlet published by the Division of Labor Standards, U. S. Department of Labor, Washington, D. C.

ABSENTEEISM War Production Drive Headquarters, WPB, Washington, D. C.

has issued a pamphlet on "Ways of Dealing with Absenteeism." Included are methods, effectively used in-plant causes, and suggestions for devoloping community cooperation in handling out-plant causes.

ADJUSTABLE LAPS A catalog of the Brickner-Kropf Machine Co., Muskegon Heights, Mich., describes that company's line of adjustable hole laps, gives prices of each and instructions for the care of lap tools.

AIR CLEANING Dust and fume control equipment produced and installed by Schmieg Industries, Detroit, Mich., is pictured and described in detail in a recent publication.

BLUEPRINTING MACHINERY A folder issued by The American Photocopy Equipment Co., 2849 N. Clark St., Chicago, Ill., lists the type of work done by the "Apeco" copy machine, and shows the many time- and labor-saving features offered by this device.

BRAKES A new bulletin has been issued by the Empire Electric Brake Co., Newark, N. J., describing in detail the Magdraulic electric brake, and presenting engineering drawings giving the dimensions of three stock sizes, and other pertinent details.

CABLE CONSERVATION A booklet of the Keystone Lubricating Co., 21, Clearfield and Lippincott Sts., Philadelphia, Pa., contains information on the subject of wire cable conservation.

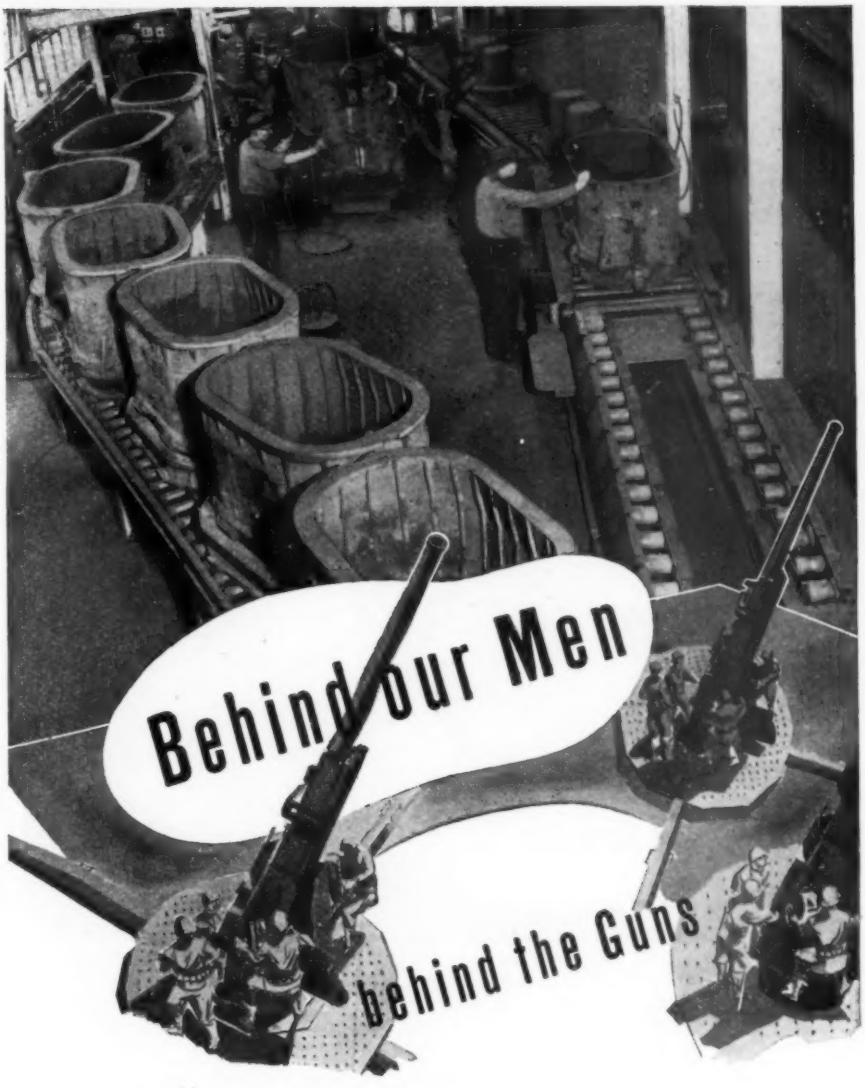
CABLE STRETCHER A fully illustrated folder describing its cable stretcher has just been completed by The Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio. It is designed to be interesting to manufacturers of aircraft equipment seeking new and improved methods for pretesting and prestretching aircraft cables.

CLEANING The Magnus Chemical Co., Garwood, N. J., has just issued a new 72-page illustrated manual, "The Metal Cleaning Handbook," which provides an organized means of selecting cleaning materials, methods of use and types of washing equipment best adapted to various uses.

COMPRESSED AIR CLEANING The Logan Engineering Co., 4900 Lawrence Ave., Chicago, Ill., has published bulletin No. 543, describing that company's Aridifier, which dries and cleans compressed air by centrifugal force.

CONTROL INSTRUMENTS A condensed catalog, bulletin No. Z6200, issued by Wheelco Instrument Co., Harrison and Peoria Sts., Chicago, Ill., fully describes, illustrates and prices that firm's line of measuring and control instruments.

COOLANT PUMPS A file-size catalog No. C43 describes and prices the complete line of coolant pumps, feed and



BACK UP FIGHTING COURAGE with the deadliest guns, bombs, tanks and planes, and you've got America's formula for victory.

There's no surer way to shorten the war . . . no surer way to save the lives of our fighting men . . . no surer way to save our American way of life.

Speeding up assembly . . . removing production bottlenecks . . . preventing hitches in the speeding movement of vital war materials is Mathews' contribution to America's war effort.

MATHEWS CONVEYERS FOR MECHANIZED PRODUCTION

If you are manufacturing war material, or anything vital to the success of the war effort, you can get Mathews Conveyers to handle that material. Rely as usual on your Mathews Engineer.

MATHEWS CONVEYER COMPANY ELLWOOD CITY PENNSYLVANIA

W-S Standard Reamers with carbide tips. Tapered shank (illustrated) and straight shank types. Sizes: ¼ to 1½.

20% PRICE REDUCTION

ON W-S STANDARD REAMERS

PRICES ON W-S STANDARD REAMERS are *now down* 20%! These new, lower prices are the direct result of our greatly increased volume on reamers and new production facilities. The majority of W-S reamer sizes is in stock most of the time. In addition, we keep numerous semi-finished shanks on hand for grinding to in-between sizes. Each W-S tool is genuine CARBOLOY tipped. *(Other brands may be specified.)* . . . Carbide tipped tools are not just a specialty with us . . . we make them *exclusively*. You can *expect* and *get* uniform, high quality results with W-S tools. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI.

Write for FREE Catalog 942 and LATEST PRICES!

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CARBOLOY CUTTING TOOLS

CENTERS ★ DRILLS ★ CORE DRILLS ★ COUNTERBORES ★ SPOT FACERS
END MILLS ★ REAMERS ★ HOLLOW MILLS ★ LATHE BITS ★ SPECIAL TOOLS

return systems offered by Atlas Press Co., Kalamazoo, Mich.

CUTTING FLUIDS Specialty Products Co., 190 Warren St., Jersey City, N. J., offers a booklet about Toolife cutting oils and cutting pil bases. Included are explanations of the various features of Toolife products and instructions for their use.

DUPLICATING "What is Duplimatic and How Does it Work?" is the title of a 16-page, three-color broadside showing a cutaway, sectional view of the automatic machine tool control manufactured by the Detroit Universal Duplicator Co., Detroit, Mich.

DUPLICATING Turchan Follower Machine, 8259 Livernois Ave., Detroit, Mich., has published a file-size pamphlet describing its line of duplicators, and picturing various applications of each.

FACILITIES AVAILABLE A 20-page booklet published by the V. E. Sprouse Co., Columbus, Ind., gives a pictorial presentation of the products and services of that firm. The company specialized in the design and production of small metal parts and complete assemblies of entire machines made from such parts.

FIRE FIGHTING Walter Kidde & Co., 140 Cedar St., New York 6, N. Y., has issued a 15-page file-size booklet, "How to Teach Fire Fighting," designed to aid factory executives in instructing employees in fire-extinguishing techniques.

FITTINGS A new catalog supplement published by The Weatherhead Co., 300 E. 131 St., Cleveland, Ohio, for convenience combines that firm's diversified lines of tube and pipe fittings and flexible hose assemblies.

GEAR CHECKING A booklet published by the National Broach & Machine Co., 5600 St. Jean, Detroit, Mich., describes a "Simple, Rapid and Accurate Machine for Checking Gear Dimensions."

HEATING Engineering information on high production convection heated ovens for batch and continuous heating processes for armament production is given in Part II of a booklet offered by the Industrial Oven Engineering Co., Detroit Ave. at W. 117 St., Cleveland, Ohio.

GRINDERS A folder published by Willey's Carbide Tool Co., 1340 W. Vernor Highway, Detroit 16, Mich., described two new carbide tool grinders now in production by that firm. Complete specifications are given.

GRINDING Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, Ohio, recently reprinted its education booklet, "Principles of Centerless Grinding," No. G-503-1. It contains

many new illustrations and information on centerless grinding.

HYDRAULIC POWER Two new 4-page catalogs, one describing hydraulic power units and the other hydraulic test units, have been released by Hydraulic Machinery, Inc., 12825 Ford Road, Dearborn, Mich.

INSPECTION The "Inspectograph," manufactured by S. Lowe & Sons Co., 20 Sanford St., Fairfield, Conn., for the inspection of tools and small parts, is described, pictured and priced in their circular No. 21.

LAPPING A folder published by the Timesaver Products Co., 1115 Post St., Seattle, Wash., describes the "Timesaver" lapping compound manufactured by that firm, and tells of its uses and advantages.

LATHES South Bend Lathe Works, South Bend, Ind., has published a catalog devoted to its 9-in. lathes, Models A, B and C. This 12-page, file-size catalog illustrates and describes both the bench and metal column base types available in the three models.

LUBRICANT A 4-page illustrated bulletin, No. 423-AM, on "dag" colloidal graphite as a high temperature lubricant has just been released by the Acheson Colloids Corp., Port Huron, Mich. This bulletin discusses the limitations of liquid and semi-liquid lubricants of the conventional type in high temperature applications and the properties of colloidal graphite which is made suitable for such applications.

METAL CLEANING A technical service data sheet No. 3-8-170-2, concerned with "Deoxidine No. 170," has been issued by the American Chemical Paint Co., Ambler, Pa.

METAL FINISHING The Burdett Mfg. Co., 19 N. Loomis St., Chicago, Ill., has published a file-size booklet describing its "Infra-Red Principle" Gas Burners.

METAL FINISHING "Corrosion can be Controlled" is the title of a catalog published by Protective Coatings, Inc., P. O. Box 56AM, Strathmoor Station, Detroit, Mich. The Tocol line of Synthetex, Silco, Alkacite and other coatings are described.

MILLING "Specialized Milling with Grayson Kennametal Milling Cutters," is the title of a descriptive catalog concerned exclusively with milling metals with cemented carbides, and published by McKenna Metals Co., 103 Lloyd Ave., Latrobe, Pa.

PLASTIC PARTS A folder issued by Creative Plastics Corp., Kent and DeKalb Aves., Brooklyn, N. Y., illustrates the possibilities of plastic parts in war production applications. It emphasizes the fact that all of Creative's

FOR DEFINITE DELIVERY DATES ON TURNER GAUGES..

SEND FOR THIS BULLETIN TODAY!

IT GIVES YOU UP-TO-THE-MINUTE PRODUCTION DATES ON:

PLUG • RING • SNAP • FLUSH PIN • BUILT UP •

Because all trade journal advertisements have to be prepared 30 days before publication date, it is impossible for the Turner Gauge Grinding Company to publish accurate delivery dates in their advertisements. That is the reason why Turner asks you to write for the "Turner Bulletin" which is issued each month just after the publications are sent out. In this way, Turner is able to check their latest production schedules, so that they can give you up-to-the-minute delivery dates on their gauges, thereby assuring you of definite deliveries.

IMPORTANT

Let us put you on our mailing list so that you will be sure to receive this important bulletin each month. Send your name today!

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TURNER GAUGE GRINDING COMPANY
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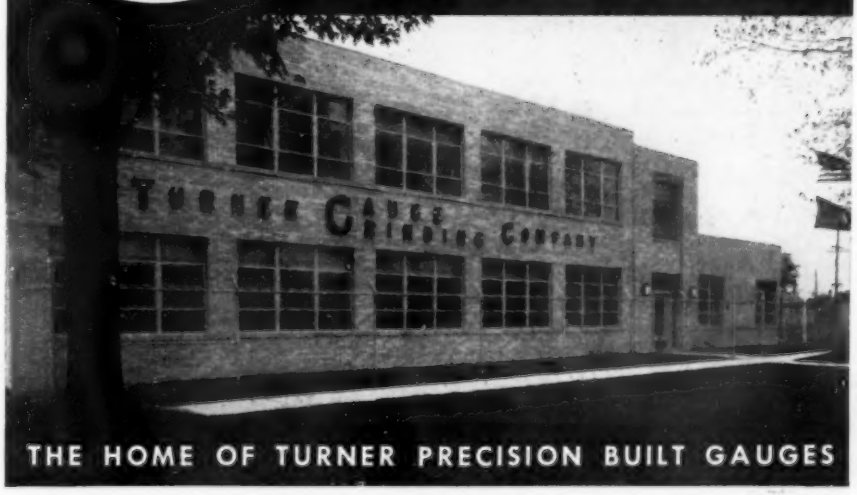


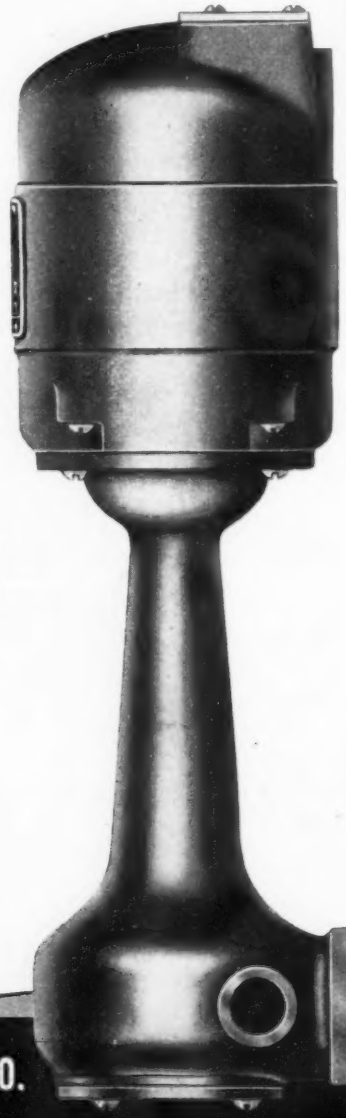
THE HOME OF TURNER PRECISION BUILT GAUGES

And Now!

A COOLANT PUMP FOR SMALL MACHINES

A mounting bracket type pump that offers a choice of three outlets from which piping can be arranged to left, right, or back through the coolant sump. Mounted integral with heavy duty, long hour, totally enclosed ball-bearing motors, fully guaranteed by reputable motor manufacturers. Despite its diminutive size, it performs with the same high efficiency as its larger counterparts. Sealless type pump, operating with no metal - to - metal contact of moving parts. Designed especially for service on small machines such as grinders, drills, tapping machines, etc.

MODEL MVBD



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19651 JOHN R STREET
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plastics fabrication is done without molds, and to closest tolerance specifications.

PLASTIC TUBING Bulletin No. P-4 of the Hodgman Rubber Co., Department P, Framingham, Mass., describes that firm's "Saran" chemically resistant plastic tubings and fittings.

POWER TRANSMISSION Payne Dean & Co., Laconia, N. H., has issued a bulletin describing the Dean Universal Angle drive and giving specifications and engineers drawings.

PRINT MAKING The Paragon-Revolute Corp., 77 South Ave., Rochester 4, N. Y., has issued a new "Handbook of Print-Making and Processing," covering the use of blueprints, direct process prints, sepia prints and reproduced tracings, and listing the advantages of each. The publication is designed to save time and effort for those charged with the installation and supervision of reproduction departments.

PULLEY LAGGING Victor Balata & Textile Belting Co., Easton, Pa., manufacturers of "Grip-On," pulley lagging has issued a circular fully describing and pricing this product and giving methods of applying it.

PUNCHING AND NOTCHING Bulletin G, just published by the Wales-Strippit Corp., North Tonawanda, N. Y., gives a brief description of that company's manufacturing and engineering facilities as well as the patented features built into Wales punching and notching units.

RELIEF VALVES A single-page file-size publication of Merit Engineering, Inc., 40 Clifford St., Providence, R. I., describes that company's line of self-stabilizing relief valves.

SAFETY "A Guide to the Prevention of Weight-Lifting Injuries," (special bulletin No. 11), has been issued by the Division of Labor Standards, U. S. Department of Labor, Washington, D. C.

SAFETY Another publication devoted to safety, and issued by the Division of Labor Standards, U. S. Department of Labor, Washington, D. C., is one for supervisors, entitled "Safety Speeds Production."

SHIPPING "How to Ship by Air Express During Wartime," is the title of a ready-reference handbook, file size, issued by Railway Express Agency, 230 Park Ave., New York, N. Y.

SHIPPING Issue No. 12 of Acme Process News, published by Acme Steel Co., 2840 Archer Ave., Chicago, Ill., describes the use of "steel-strap" for packaging a variety of materials.

STEEL "Manganese Steel for General Industry," published by the American Manganese Steel Division of American

Brake Shoe Co., Chicago Heights, Ill., shows how this steel can prove helpful to industry and describes the company's X-ray facilities, metallurgical and testing laboratories.

TANK LININGS A catalog section on its new sheet Koroseal linings for tanks made of welded steel, wood or concrete has just been published by The B. F. Goodrich Co., Akron, Ohio.

TEMPERATURE CONTROL In their catalog N-33-163, Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa., describes "Micromax Temperature Instruments for the Steam Plant," and describes applications to temperature measurement of steam, feedwater and cooling water, and to fuel, combustion air and flue gas.

TEMPERATURE CONTROL A complete line of standardized industrial thermocouples, along with their parts, assemblies and accessories, and information on their proper use constitute catalog No. 3 of Arklay S. Richards Co., 72 Winchester St., Newton Highlands, Mass.

TRAINING To help train inspectors and machinists in the use of gage blocks and vernier instruments, the Jansson Gage Co., 19208 Glendale Ave., Detroit, Mich., has issued a "Handbook of Precision Measurement." Executives requesting it on their letterheads may receive a complimentary copy; to individuals the charge is 50 cents.

TRANSFORMERS A new 4-page illustrated bulletin, No. 43-AT, describing the new type economical Eisler air-cooled transformer designed for service in restricted locations where safety against explosion and fire hazard are required, has been published by Eisler Engineering Co., 740-770 S. 13 St., Newark, N. J.

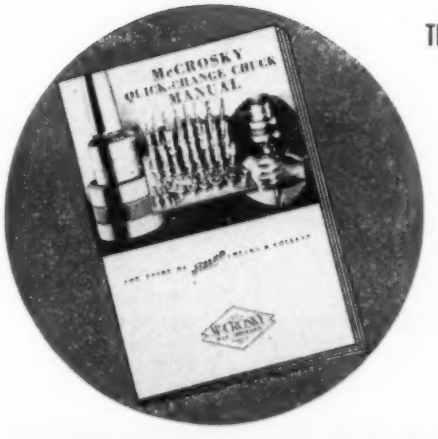
TRANSMISSION "Up to 30 hp." is the title and theme of a 4-page catalog, published by Western Manufacturing Co., 3400 Scotton Ave., Detroit, Mich., describing the three models of transmissions for motorizing various cone-driven machine tools.

TRUCK BATTERIES To provide full information on battery purchases and care to the truck operators of the nation, U. S. Rubber Co., Rockefeller Center, New York, N. Y., has issued a complete "Truck Battery Guide."

TUBING Supplementary pages for the "Aircraft Tubing Data" handbook of the Summerill Tubing Co., Bridgeport, Pa., are being sent to registered holders of that design handbook.

TURBINES The planning and development of Cleveland's three pumping stations, all equipped with geared turbine-driven centrifugal pumps, is described and equipment pictured in leaflet E-1179 prepared by the De Laval Steam Turbine Co., Trenton, N. J.

Send
for copies of the new McCrosky Quick-Change Chuck Manual. It features 21 pictures showing successive steps in drilling and tapping. Other operation and maintenance instructions covered include removal and replacement of chuck collars and adjustment of tap-holder friction. Write to
McCROSKY
Meadville, Pa.
McCROSKY TOOL CORPORATION



THE McCROSKY QUICK-CHANGE CHUCK MANUAL

is one of several handbooks prepared to help the user of McCrosky Cost Cutting Tools to improve and protect his production. Also available are the McCrosky Reamer Manual, the McCrosky Boring Bar Manual, and various bulletins and engineering data sheets, covering all units in the McCrosky line as listed below.

McCROSKY COST CUTTING TOOLS
◆ SUPER ADJUSTABLE REAMERS ◆ ADJUSTABLE BORING BARS
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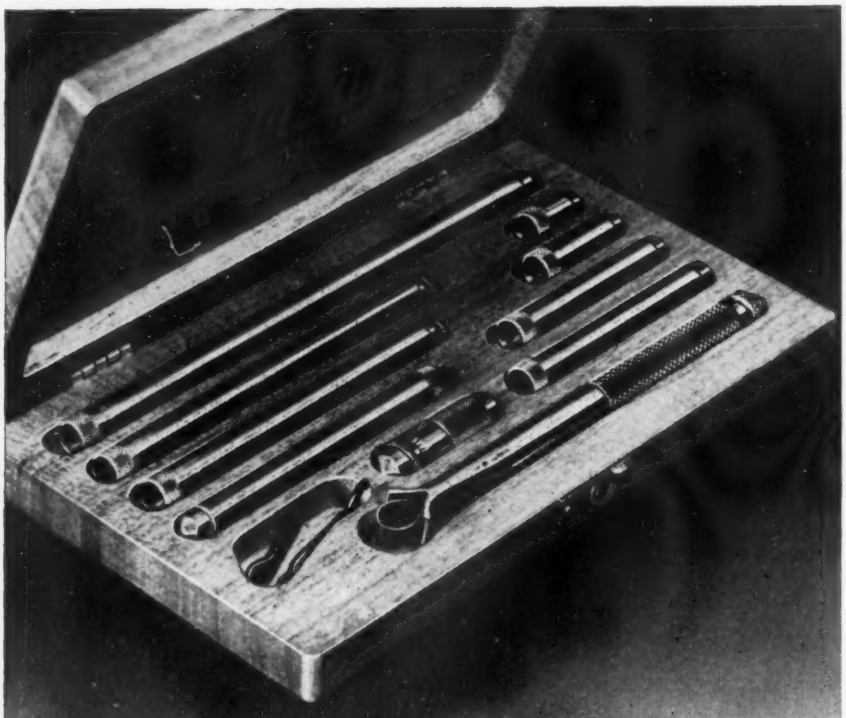

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INSIDE MICROMETER CALIPERS

FOR BETTER "BALANCE AND FEEL"

For taking exact inside measurements Lufkin Inside Micrometers out-perform all others. Available in sets for taking accurate measurements from 1½" to 40".

Being of hollow steel tubing the measuring rods are light in weight, yet very rigid. The rods can be added to either or both ends of the micrometer head. The head can be kept in the center for better feel, easier adjustment and best reading position.

Rods are adjustable by means of a hardened and ground plug at one end to allow for wear.

For complete facts about these or any other Lufkin precision tools see your distributor. Write for catalog.

LUFKIN

SAGINAW, MICHIGAN · NEW YORK CITY

TAPES · RULES · PRECISION TOOLS

WELDING The James F. Lincoln Arc Welding Foundation, Cleveland, Ohio, will soon publish a 1,200-page book entitled "Studies in Arc Welding," and containing 98 of the outstanding award studies submitted in the Foundations 1940-1942 Industrial Progress Award Program.

WELDING Bulletin B6241B, issued by Allis-Chalmers, Milwaukee, Wis., describes that company's Ampac "200" welder and gives details of the manner in which it may be used.

WELDING The Industrial Division, Ransome Machinery Co., Dunellen, N. J., has just issued bulletin No. 188, describing its turning rolls for facilitating welding of large cylindrical tanks and drums, and bulletin No. 196, illustrating and describing the 2,500-lb. capacity hand-operated welding positioner.

WOMEN WORKERS "A Message from the Women Soldiers of the Production Front," is the descriptive title of illustrated book No. 1950 released by Link-Belt Ordnance Co., 306 West 37 St., Chicago, Ill. It contains expressions of the views of women workers, along with illustrations of their occupations.

ZINC PLATED STEEL A folder prepared and offered by the American Nickeloid Co., Peru, Ill., describes zinc plated steel sheet as "practical alternate for more critical metals." Pertinent statistics on the properties of the material are given.

NEW BOOKS

THE INDUSTRIAL CAFETERIA AND RESTAURANT WORKER'S MANUAL— *By Milton A. Rosenfeld, restaurant management consultant. 107 pages. Published by the National Foremen's Institute, Inc., Deep River, Conn. $1.25.*

Among the training problems that the war has dropped in industry's corporate lap is the development of food handling personnel. With employment rolls inflated and new plants located in isolated sections, cafeterias have become important service departments in many shops. One of Washington's favorite pronunciamientos is that "Food Will Win the War." High in the list of people who must eat well are America's industrial workers.

This small handbook was written to help cafeteria and restaurant workers do a better job. It is styled as a collection of maxims—simple in statement, practical in application—which apply to all phases of food preparation and service. The twenty chapters cover the worker's appearance, health and safety, the organization of the department, the choice and use of equipment, and the handling of the food itself. An appendix gives a chart of food values, hints for preparing beverages,

sizes of canned foods, and methods of storage.

The book would be useful at any time, but has special application to the war situation. For example, while speaking of dish washing it warns that "Wartime silver must be dried very carefully, or it will rust and peel." Rationed foods are given special consideration, plant noises are discussed as an element in the picture, salads are treated as "Victory Foods."

Though aimed at the restaurant worker, the manual would also be valuable to management as a ready reminder of the factors involved in keeping shop employees happy and well.

Armor Plate Milling—Discussion

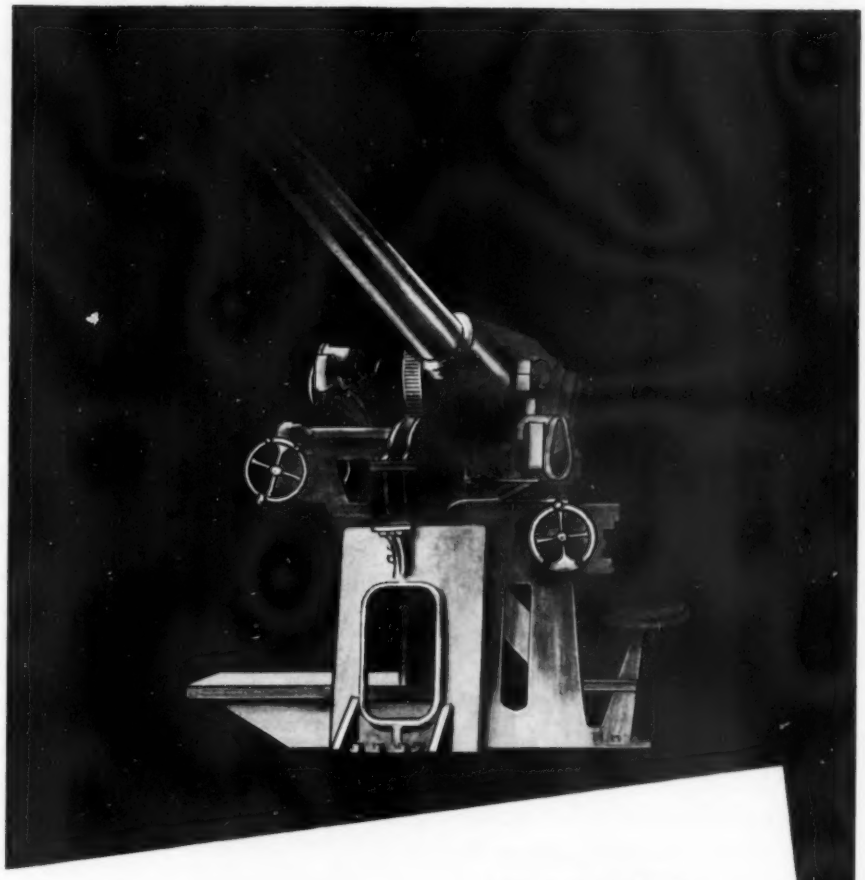
By WILLIAM F. PIOCH
Chief of Mechanical Design, Ford Motor Company

To us, the milling armor of plate, has been more or less a trial and error method, because we have only two real milling operations. We have taken this method because of the delayed delivery on special tools.

The greatest hazard to our temporary cutters are flame-cut edges which are found on nearly every piece we have to machine. The Brinell reading on the armor plate varies according to the thickness; ¼ in. thickness will Brinell 341 to 388 and ½ in. thickness 241 to 285, which shows the hardness is not too great. The above Brinell readings must be held to the limits shown and are made on opposite corners of a plate to check uniform heat-treatment. The depth of cut is uniform because the plate is run through a McKay leveler, which bends the metal to the limit of its elasticity, and returns it to a flat surface held within 0.001 in. limit.

The extreme toughness of armor plate is our greatest machining difficulty. The front hull plate, which has been cut to shape by Travograph flame cutters, must be milled for a joint face. The operation is performed on a new Cincinnati vertical mill. We use either a 18-4-1 or 6-6 solid high-speed-steel end mill, 3.50 in. diameter, with 12 teeth at 15 deg. right-hand helix and 10 deg. positive rake. The cutter is ground in our toolroom to a conventional steel grind. The cutting edge and face must be smooth and free from ragged edges. The large helix angle and rake have a tendency to get in and under the metal for a clean cut. The smooth face and clean cutting edge prevents the metal from building up on the cutting edge. It is important to realize that a clean cut must be made to get any life out of the cutter at all.

The cutter is run at a speed of 154 r.p.m., or 140 surface ft. per min. This seems fast, and although the life of the cutter is cut down considerably, a good finish is obtained at this speed. In the majority of cases, however, the damage to the cutter can be corrected by an additional grind. The depth of



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GUN MOUNTS
Manufacturer 100% Sold on Capewell

The longest record of blade life, on a job of sawing 4140 steel gun mounts for a midwestern manufacturer, was turned in by Capewell's Technite, molybdenum high speed, hack saw blades. Have you tried these rugged, fast-cutting, precision blades on YOUR tough job? Order from your mill supply man today.

The Capewell Mfg. Co., Hartford, Conn.

CAPEWELL
The Trend is to TECHNITE
The Molybdenum High Speed Hack Saw Blade

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QUICK ACTION VISES

THIS work-tested, quick-action Vise has demonstrated its capacity for fast, dependable service for over twenty years.

Outstanding advantage is in the time-saving, easy-operating method of holding work securely and rigidly during machine operations.

No slow hand cranking to close the vise jaws on the material. Instead, a quick-action cam lever throws the jaws together instantly, evenly, solidly; then the eccentric handle locks the work in a doubly secure grip.

On jobs where there are milling, drilling, tapping and assembling operations — where a rugged, high-speed vise is required — that is where the FENN find its place.

Three sizes - 4", 5" and 7".

Send for Bulletin No. 10

THE FENN MFG. CO.
HARTFORD, CONN.
ESTABLISHED 1900

cut is ⅜ in. and 1½ in. thick with a feed of 5 in. per min. At that speed the cutting edge chips and the metal welds itself to the tooth.

The maximum life of the cutter per grind is about 40 ft., depending on the number of hard spots encountered. A cutting fluid mixed with about 12 parts of water helps considerably.

An inserted-blade cutter has been received for a multiple cut on the same operation. The new cutter will machine the top face, chamfer the side and mill the side of front hull. Especially built to machine cast armor plate, the blades on the new cutter will be of high speed steel.

What War Material Can Machine Tool Shops Make?

Rumors, which seem well founded, indicate that as machine tool plants have spare machining capacity because of fewer orders, they are to produce parts for the various weapons of war. Instead of further enlarging their plants and hunting for subcontractors they will become subcontractors themselves in many cases. This should have a good effect in several ways. The average worker in a machine tool shop is a better mechanic than is found in many mass production plants. And the making of parts in a plant that has previously built lathes or planers will show the error of those who have looked at machine tool plants as mass production units. Except for certain departments, few machine tool builders can be called production shops.

This makes it something of a problem for machine tool shops, and for those who wish to place war materiel orders in these shops, to decide just what they can make best. Many machine tool shops are already studying the question seriously. Some have already taken orders for work in entirely different lines. Others are looking for work to utilize their present capacity, or capacity that will be available shortly. And some at least, are more or less anxiously studying the problem of post-war production. The present need, however, is to utilize all available capacity for war materiel.

Windowless Shops

Shops built without windows have been the subject of many discussions, some of them of a more or less violent nature. The idea of shutting workers into a building with no windows to look out of seems to many to be a step backwards. But there is another side to the story, as is usually the case, if we look at it from another angle.

Suppose we ask the objectors just why windows were put in shops and other buildings in the first place. Were they put in to enable the workers to gaze on the landscape? Far from it. They were put in primarily to let in light enough so the men could see to work. A second reason was to assist ventilation in the hot weather. Looking out at the scenary was a byproduct, and entirely incidental.

Windowless buildings secure better and more uniform lighting by proper use of electric illumination than can possibly be had from windows. Daylight illumination varies from hour to hour, or at shorter periods, and is never as good as the artificial for factory work. And without windows air-conditioning can secure just the temperature and humidity that is best both for the work and the worker. Constant temperature is necessary for very accurate work. And few workers miss the windows after a short time. Work keeps them busy.

Tooling Division Definitions

Courtesy Christy Tool Engineering

DRAFTING ROOM—A place where the time between arguments is spent in making drawings to be changed.

BLUEPRINT FILES—A place for discussing everything but business and keeping the counter waiting.

MANUALS & STANDARDS BOOKS—A collection of information nobody uses.

TRACING—A piece of paper or linen used for taking high spots from erasers.

BLUE PRINT BOY—A skunk with a dirty neck who smokes cigarettes, watches the clock, and sometimes makes a print.

WHISTLER—A form of the seven-year itch in its most aggravating form.

CLERK—A squirt with an imaginary hangover from his "wild" times the night before—sometimes types or performs his chores, if he feels like it—providing he has time.

DETAILER—A slave, who, knowing nothing himself, never understands what the draftsman thinks he knows.

DRAFTSMAN—One who puts ideas on paper for his "boss" to change.

TOOL PLANNER—A second class clerk who failed to make the grade as a draftsman.

TOOL DESIGNER—One with a collection of erroneous ideas surrounded by several "experts" and standard books.

GROUP LEADER—A "lucky dog" who holds his job by taking credit for the ideas of his designers.

CHECKER—A pessimist with a red pencil, a chronic indigestion, and no conscience, who spends his time trying to figure out other ways of doing everything.

PROJECT DESIGNER—A "fall" guy between his designers and the "brains."

PROJECT SUPERVISOR—A former draftsman who has lost his ambition for

Specify SHEFFIELD ARMY-NAVY

AERONAUTICAL TAPER PIPE THREAD GAGES

★ ★ ★

All styles of Taper Pipe Thread Gages included in Specification AN-GGG-P-363 for the inspection of aircraft fuel and oil line connections, are available from Sheffield.

Write for Bulletin #43-1 describing the use of one and three-step L_1 and L_3 plugs, 6-step plain plug, L_1 and L_2 thread rings, the 6-step plain ring—and other gages used in aircraft parts inspection.

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MASTER GAGEMAKERS

THE SHEFFIELD CORPORATION

Dayton, Ohio, U.S.A.

THIS IS THE WHEEL* MR. JONES

• Maybe you were stumped by grinding jobs before, but they won't worry you any more.

300 shapes and sizes—every grade and grain—there is a Chicago Mounted Wheel custom-built to take on *any* grinding problem. Each wheel is a whirling point of power that turns your jobs out smooth—and in a hurry.

PROMPT DELIVERY

Action is the keynote from the moment your order comes in. Our wartime set-up concentrates on mounted points and grinding wheels 3" in diameter and under. Production is stepped up and keeps pace with demand. Another advantage to you is our central location.

*Half a century of specialization has established our reputation as *the* small wheel people of the abrasive industry.

TEST WHEEL FREE—Tell us the job, type grinder and size wheel you use and we'll send one prepaid.

NEW CATALOG—Shows Chicago Mounted Wheels in actual colors, also portable electric tools and time-saving accessories.

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details, but who likes to take credit for and put his name on everything that looks like a piece of paper or drawing. A mechanical "genius" who spends his time thinking up ideas which he refuses to recognize when he sees them on paper. If they click, they're his ideas—if they flop, everybody should have known better.

Boss—An intellectual midwife officiating at the birth of the designers ideas and the direct cause of many stillbirths and abortions. His flea sized mental gullet is continually choking on factual elephants. He is also chief buck passer, the master politician, the pariah of the drafting room caste system and also the clerk who passes out the checks.

—*Author unknown*

Wearproofing Cast Iron Bushings

By GROVER C. MASTERS
Thomas A. Edison Industries

Because of the present strategic importance of all types of steels, particularly tool steels, we have experienced some difficulty in replacing wear bushings in feed mechanisms for screw machines. Bronze bushings to replace the steel bushings ordinarily employed did not work out well. Tungsten-carbide lined bushings were tried, but the application was not entirely satisfactory.

Finally, after a number of other substitutes had been tried, we resorted to gray cast iron bushings which are cyanide hardened in the bore after being machined to size. These bushings have a non-galling characteristic which eliminates the seizing problem encountered with other materials, and have better resistance to wear than do carbide-lined bushings available for screw machine use.

A number of years ago the writer made temporary drill bushings in the same manner with satisfactory results. Also, circular form tools for screw machine operations on plastics and celluloid were made up from gray cast iron by finishing the tool to size and then cyanide hardening only the cutting face of the tool along the cutting edge.

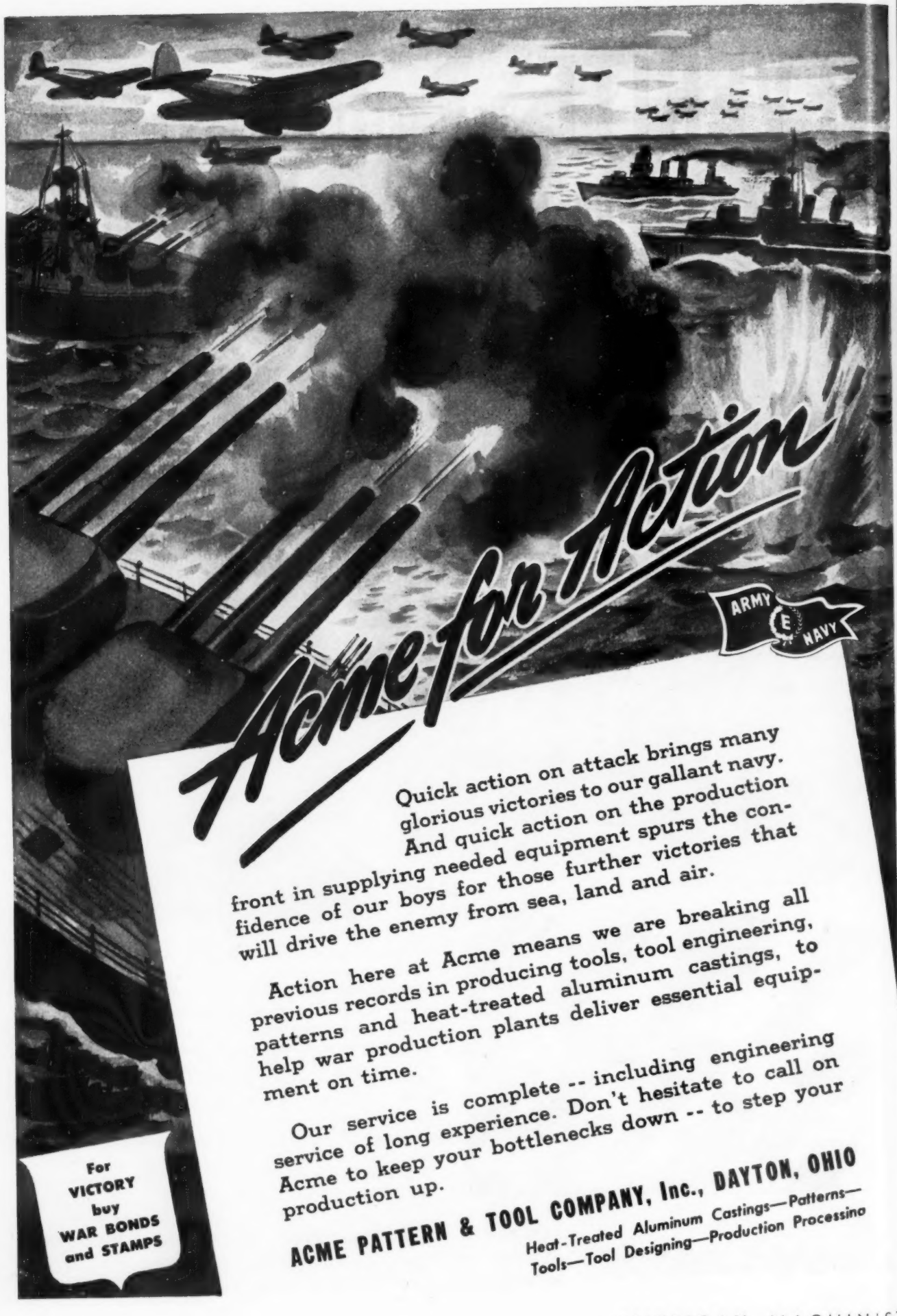
To harden bushings up to about ⅝ in. inside diameter, it is best to heat them to 1,400 F., remove the bushings individually from the furnace with tongs, drop a ball or two of cyanide about the size of a BB shot into the bore, letting the cyanide run over the surface of the bore of the bushing, and then replace the bushing in the furnace and hold it at a temperature of 1,400 F. until the cyanide boils. Then the bushing is removed and dipped in water. Care should be taken to prevent the cyanide running over onto the outside surfaces of the bushing, or cracks will occur. The cutting face of a form tool is hardened in the same manner, with the cyanide being applied only to the face of the tool immediately adjacent to the cutting edge.

SEVERITE HEAT-TREAT PROCESS DOUBLES THE LIFE OF YOUR NEW AND REGROUND CUTTERS

"Severite," an exclusive high speed tool steel hardening process, is now available at no additional cost on all new Severance Midget Milling Cutters and any make of tools which you have reground by Severance. "Severite" is the result of exhaustive experiments and field testing on the part of Severance engineers to help conserve America's critical supply of High Speed Tool Steel. And the result has been most gratifying—users report that the "Severite" process increases the efficient life of cutters from two to five times. This extra service, offered only by Severance, is one more reason why it will pay you to use new Severance Midget Milling Cutters and Severance Regrinding Service. Write for complete information and prices.

Severance

SEVERANCE TOOL INDUSTRIES INC., SAGINAW, MICHIGAN.
PLANTS IN LONG ISLAND CITY, NEW YORK; CHICAGO; DETROIT; FORT WAYNE, INDIANA; LOS ANGELES



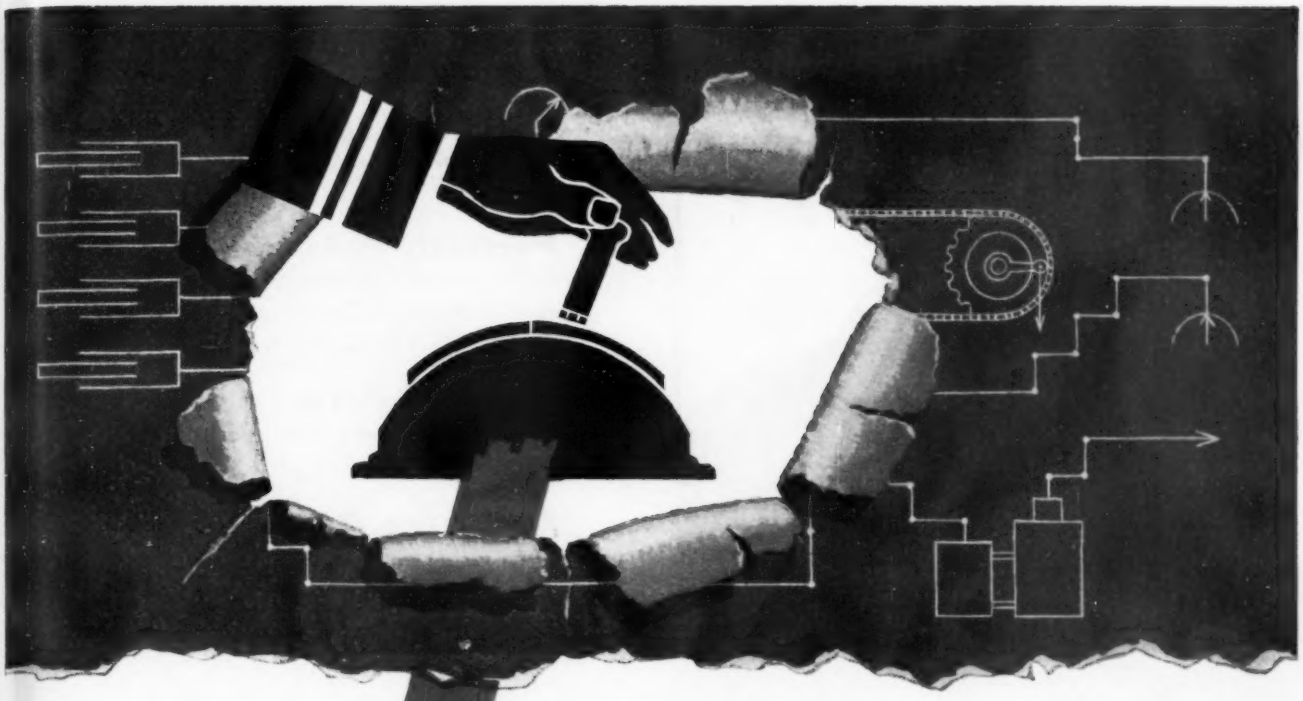
Quick action on attack brings many glorious victories to our gallant navy. And quick action on the production front in supplying needed equipment spurs the confidence of our boys for those further victories that will drive the enemy from sea, land and air.

Action here at Acme means we are breaking all previous records in producing tools, tool engineering, patterns and heat-treated aluminum castings, to help war production plants deliver essential equipment on time.

Our service is complete -- including engineering service of long experience. Don't hesitate to call on Acme to keep your bottlenecks down -- to step your production up.

ACME PATTERN & TOOL COMPANY, Inc., DAYTON, OHIO

Heat-Treated Aluminum Castings—Patterns—Tools—Tool Designing—Production Processing



All work—and no play!

A lot of modern products and plant equipment aren't performing up to design possibilities . . . because controls haven't kept pace with the mechanical developments. W·A·B Remote Control Systems take these hobbles off.

With W·A·B Controls, you can govern an almost limitless variety of multiple functions from one small, compact station. These systems work every time—all the time. They eliminate play, back-lash and overrun. They make connecting links, levers, bell-cranks and similar devices unnecessary.

W·A·B Control Systems respond to a touch instead of a tug, yet can exert a powerful operating force where required. A group of functions can be progressively handled by a series of movements, front to back, of a single control handle.

In engine controls, for instance, movement of the handle in the forward quadrant produces as fine and precise control as hand throttling, while the mere movement of the handle through the neutral position can declutch, apply a shaft brake, reverse the gears or cam shaft, release the brake, and re-engage the clutch.

The basic operating principle provides graduated pressures that cushion equipment against shock, and prevents error by the operator in the speed or the order of sequence operations.

Whether you are concerned with production or with product improvement, it will pay you to check your control needs against the advantages that W·A·B Remote Control Systems offer. In many cases, problems have been completely solved with regular "off the shelf" W·A·B devices. Phone, wire or write.

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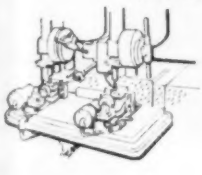

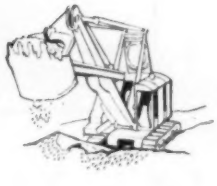

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Perfectly Balanced—Every rotating part of both motor and quill is balanced statically and dynamically to eliminate the slightest possibility of vibration.

Matched Parts— Mating parts are specially selected to keep dimensional clearances practically at zero.

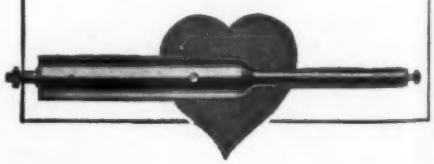
Exclusive Quill Design—Patented pre-load spring and patented "Fog-of-Oil" lubrication, assure high initial and sustained precision under long hours of operation.

Gages being their sole product, the Shoberg Tool Company depend upon high precision equipment to supply their customers with gages of a wide variety, for vital war production uses. Grinding to closest possible limits is almost a continuous process in this shop, and the Dumore Precision Grinder functions as a real production machine, busy every working hour. Consistent performance under these conditions is possible only because of the high precision and lasting durability engineered and built into every detail of the Dumore Grinder!

Does high precision in large volume constitute a problem with you? Your Dumore distributor can show you how other shops are applying the "Dumore System." Or write us for a copy of our Catalog 42.

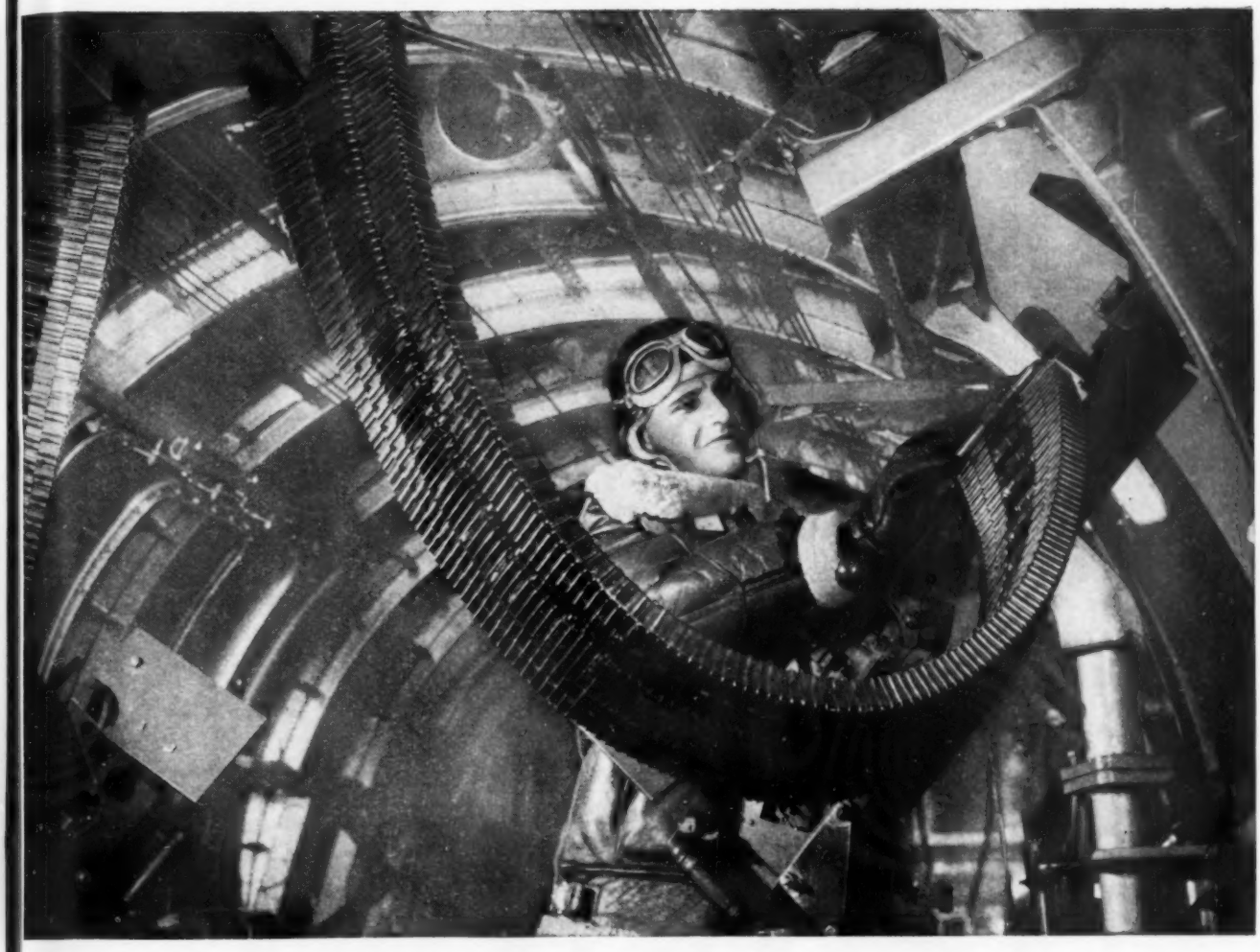
The Heart of the Grinder is the Quill!

Here the elements of precision and durability are combined to give trouble-free performance. Many plants install Dumore Quills as replacement units in existing grinders. Get the Dumore Catalog 42 for full details!



Dumore PRECISION GRINDERS

THE DUMORE COMPANY, RACINE, WISCONSIN



600 ROUNDS-A-MINUTE...per Gun!

INSIDE this Flying Fortress, the side gunner inspects belts which feed up to 600 bullets a minute as the big ship gets set for a trip over enemy targets. For guns like these, the need is absolutely vital for unlimited amounts of ammunition.

In producing not only the ammunition, but guns, planes, ships, tanks, and other weapons, war plants everywhere are increasing output and lengthening cutting-tool life, by using *Texaco Cutting Oils*.

For example, on both *al*uminum and *mag*nesium, *Texaco ALMAG Cutting Oil* adequately cools and lubricates the cutting tools, prolongs their life, increases cutting speeds, steps up output. *ALMAG* is transparent, permitting the operator to *see* . . . and is non-irritating to the skin.

So effective have Texaco lubricants proved that they are definitely preferred in many other important fields, a few of which are listed in the panel.

A Texaco Engineer specializing in cutting coolants will gladly cooperate in the selection of the most suitable lubricants for your equipment. Just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

THEY PREFER TEXACO

★ More buses, more bus lines and more bus-miles are lubricated and fueled with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

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★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

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TEXACO

TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS FOR FASTER MACHINING

TUNE IN THE TEXACO STAR THEATRE EVERY SUNDAY NIGHT – CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

ON THE FIGHTING FRONTS!
ON THE PRODUCTION LINES!

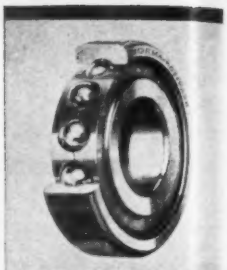
The PRECISION BEARINGS here pictured, together with many others from the comprehensive NORMA-HOFFMANN line, have literally "gone to war" for the Allied Nations.

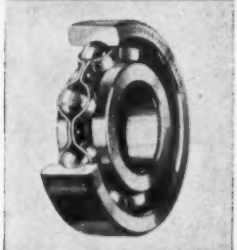
On the fighting fronts, they are "in the service" in every type of naval craft, from patrol boat to battleship—in bombers, fighters, scout planes, trainers and transports—in guns, tanks, mobile artillery, military transport and supply equipment.

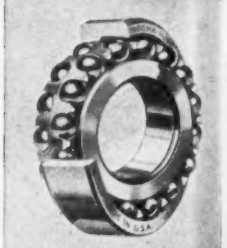
On the production lines, NORMA-HOFFMANN Bearings are in thousands of machines, machine tools, and other vital mill and shop equipment that are turning out ships, armament and indispensable war materials for the American and Allied forces.

Let our engineers work with you.

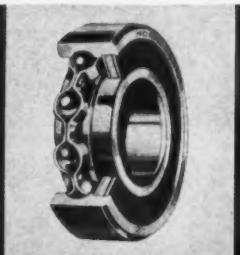
Separable (Magneto) Ball Bearing

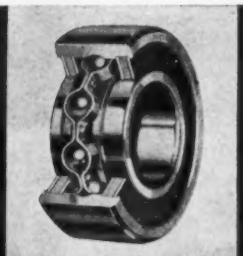

Litro ("CL") Composition Retainer Ball Bearing

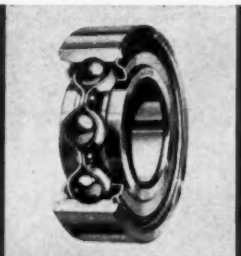

Single Row Ball Bearing


Double Row Self-Aligning Ball Bearing

Shielded Type Single Row Ball Bearing


Single Felt Seal Ball Bearing


Double Felt Seal Ball Bearing


9000 Series (Feltless) Sealed Ball Bearing

"Cartridge" Fully Sealed, Refillable Type Ball Bearing

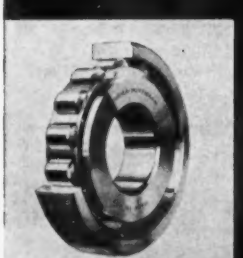
Double Row Ball Bearing

Extra Light Type Ball Bearing

Angular Contact Ball Bearing

Extra Light Single Direction Ball Thrust Bearing

Single Direction Ball Thrust Bearing


Standard Cylindrical Roller Bearing

Type "E" Cylindrical Roller Bearing

Full Type (Retainerless) Cylindrical Roller Bearing

Extra Light Cylindrical Roller Bearing

Two-Lipped Cylindrical Roller Bearing

NORMA-HOFFMANN BEARINGS CORP'N, STAMFORD, CONN., U. S. A. • FOUNDED 1911

TO WIN THE WAR: Work — *Fight* — Buy War Savings Bonds

No Smoke

NO BURNING

No Discoloration

"PASS-INSPECTION"
FINISH EVERY TIME

Reduced Temperature

TOOTH HARDNESS
UNCHANGED

Longer Wheel Life

PRODUCTION STEPPED UP

TOO MUCH TO EXPECT ?... NOT WHEN IT'S MARATHON C-16 GEAR GRINDING OIL

PROVE TO YOURSELF on your own machines how many gear-grinding headaches you get rid of when you change to Marathon C-16. This improved gear-grinding oil is "balance-compounded" to keep gear grinding machines working at top efficiency and capacity. Allows chips to settle faster, eliminating danger of scratched surfaces, lengthens wheel life, increases production. Write, wire or phone, ask for an Ohio Oil Company lubrication engineer to call with the facts.

A COMPLETE LINE OF CUTTING AND GRINDING OILS FOR EVERY METAL WORKING OPERATION.

THE OHIO OIL CO.

GENERAL OFFICES: FINDLAY, OHIO

District Offices: Robinson, Ill., Indianapolis, Ind., Louisville, Ky.

MARATHON

PRODUCERS OF PETROLEUM SINCE 1887

DON'T DO THAT!
FILE-FLINGIN' FREDDIE!.. WHEN HE CAME OFF TH' ASSEMBLY LINE, TH' STORK FORGOT HIS BRAINS!
HE KIN TAKE TH' BITE OUTA MORE FILE-TEETH THAN A STUDENT DENTIST WITH A BUZZ-SAW! POP'LL MASSACRE 'IM!
ALEXANDER

FREE REPRINTS of this ad for shop-board tack-ups

It's Pop, the foreman. And is he mad! Like any good production head—or mechanic—Pop knows what happens to a file when tossed among other files or tools. Even a few battered teeth can cause skips—throw the filing stroke out of stride—waste time—reduce stock removal—destroy filing accuracy. To say nothing of greatly shortening the useful life of the file.

High-geared war production is too important to permit tool, tool-steel, and man-hour wastage of this sort. It defeats the very objectives of quality file manufacture. In Nicholson and Black Diamond files, Nicholson goes to great pains to provide the toughest, sharpest and most uniform files it is possible to produce. A moment of carelessness in their use can undo much of this great care in their manufacture.

The right file for the job and *Twelve perfect files in every dozen* are long-standing guarantees in the Nicholson policy of providing industry with the utmost value for every file-purchasing dollar.

NICHOLSON FILE CO. • 29 ACORN ST., PROVIDENCE 1, R. I., U. S. A.
(Also Canadian Plant, Port Hope, Ont.)

FREE BOOK **"FILE FILOSOPHY,"** the Nicholson 48-page book on files and filing, includes useful information on the care of files. FREE to purchasing and production heads, foremen and key mechanics.

NICHOLSON FILES
FOR EVERY PURPOSE

NICHOLSON U.S.A. MADE IN U. S. A.

Here's how SKILSAW TOOLS BOOST PRODUCTION at LINDBERG ENGINEERING CO.

SKILSAW PORTABLE GRINDERS—Speed up all grinding, wire brushing, buffing and polishing on metal surfaces ... remove rust, scale, paint, etc.

SKILSAW DISC SANDERS—For faster sanding on flat or curved surfaces of wood, metals, compositions. For grinding down raised welds, surfacing, preparing for finishes, buffing and polishing.

ARMY E NAVY

Ask over at Lindberg Engineering Company ... and you'll hear plenty about the speed of SKILSAW TOOLS in turning out essential heat-treating equipment. Look around the Lindberg plants that fly the Army-Navy "E" ... and you'll see plenty of SKILSAW TOOLS in action ... speeding up countless drilling, sawing and surfacing operations!

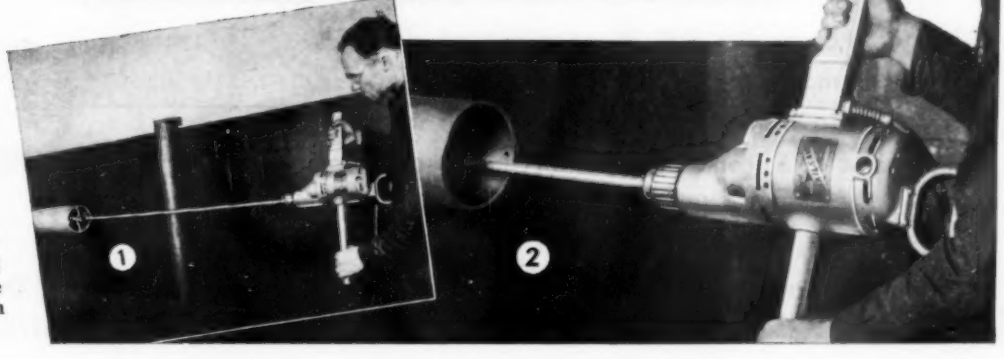
Here's the reason! SKILSAW TOOLS are lighter, more compact, more powerful. They're *preferred* by workers and management alike because they *handle easier* ... do more jobs *better* ... and stand up *longer* under today's toughest conditions. Ask your distributor to prove it with a demonstration of SKILSAW TOOLS on your own work *today!*

SKILSAW, INC., 5059 Elston Ave., Chicago, Ill.

New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit
Indianapolis • St. Louis • Kansas City • Atlanta • New Orleans
Dallas • Los Angeles • Oakland • Portland • Seattle • Toronto, Canada

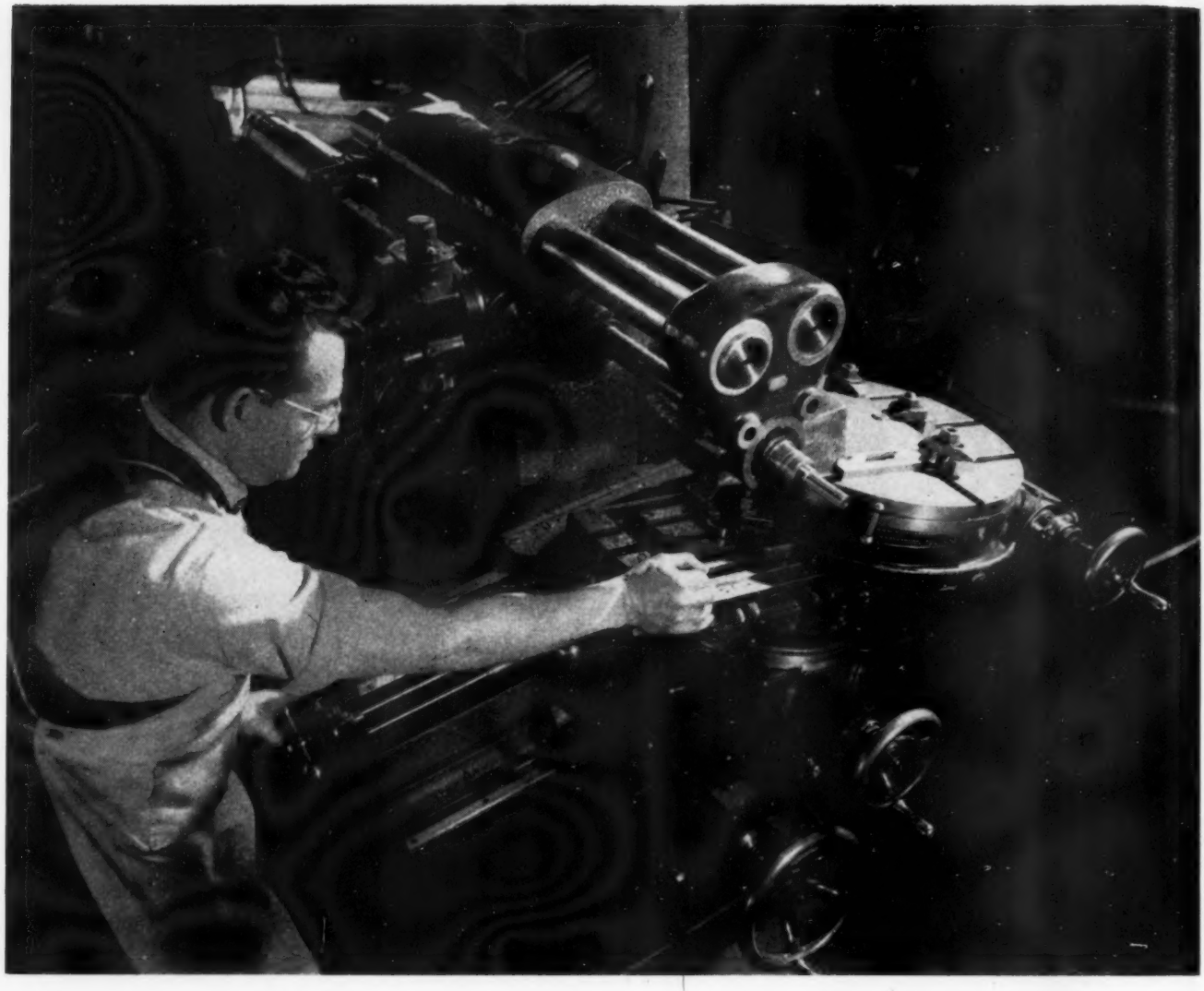
SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★



1. With a special rig devised by Lindberg engineers, SKILSAW Model 123 DRILL hones the interior of this air-tight steel cylinder; replaces complicated hard-to-get machinery.

2. Honing rig on long shaft (smoothly driven by SKILSAW DRILL) is moved forward and back by operator, to produce the polished high precision surface necessary.



Men and Machines that Shape the Future...

Tomorrow's engineering achievements—faster transportation, better radios, sounder buildings, the wider and greater use of plastics—are on the drafting boards today, projects of post-war planning boards, foreseen by men of vision. With many of these advances Taft-Peirce will be identified, for the Taft-Peirce Contract Service Division combines the skill of experienced designers and master machinists with an extensive array of more than one thousand modern machine tools . . . a combination that has made hundreds of contributions to better living. The unique facilities of this organization, from drafting room to inspection laboratories, are at your service to assist you in the design, tooling and manufacture of a single part or complete mechanisms in quantity lots. For complete information on how these facilities may serve your design or production department, write for a copy of an interesting illustrated brochure. The Taft-Peirce Manufacturing Company, Woonsocket, Rhode Island.

TAKE IT TO TAFT-PEIRCE

For Design,
Tooling and Contract Manufacturing

5 ways to attach high-speed tips to plain steel shanks

Now that it is necessary to conserve every ounce of strategic alloy elements, many tool-steel users are tipping their tools with high-speed steel, instead of using this scarce material for the entire body of the tool. Here is a detailed tabulation of five ways to tip a plain steel shank with a high-speed tip.

METHOD	1. Low Temperature Brazing or Silver Soldering	2. High Temperature Brazing	3. Fusion Cementing	4. Resistance Butt or Flash Welding
Equipment needed	(1) Heating torch or furnace. (2) Clamp for holding tip in position.	(1) Brazing furnace (Controlled atmosphere).	(1) Heating furnace. (2) Press or machine such as a drill sharpener equipped with special dies.	(1) Resistance butt welding machine. (2) Preheat furnace. (3) Slow-cool facilities.
Correct heat-treatment and shaping of tip	(1) Previously hardened and tempered. (2) Ground or machined to semi-finished size and to fit recess in shank.	(1) Annealed. (2) Ground or machined to semi-finished size and to fit recess in shank.	(1) Annealed. (2) Ground or machined to semi-finished size and to fit recess in shank.	(1) Annealed. (2) Rough cut or machined to fit shank. It is not necessary to recess shank.
Preparation of tip and recess of shank	Washed with carbon-tetrachloride or gasoline to remove grease and dirt.	Same as 1.	Copper coated in solution of copper sulphate or washed with boric acid solution.	None.
Flux	Prepared flux of low melting temperature, sold by various firms.	Borax.	None.	None.
Bonding material	Silver solder ribbon.	Copper foil.	Use one of the popular fusion cements now on the market.	None.
Temperature of operation	Below maximum draw temperature of high-speed steel tip.	At optimum quenching temperature of high-speed steel tip.	Same as 2.	Welding heat confined to surface of tip and shank to be welded.
Cooling after bonding	Air cooled	Quenched in still air, air blast or oil from brazing heat.	Same as 2.	Slow cooled after welding.
Subsequent shaping and heat-treatment	(1) No heat-treatment. (2) Tool may be ground to finished shape.	(1) Tempered to develop best cutting properties in tip. (2) Tool ground to finished shape.	Same as 2.	(1) Tool may be rough shaped to finished size by forging and/or machining. (2) Quenched and tempered to develop optimum cutting properties. (3) Tool ground to finished shape.

5.

A fifth method of tipping is by electric-arc welding. This is essentially similar to that outlined above under resistance butt or flash welding. The only differences are that you use an electric-arc machine, bevel the edge of the tip and of the shank in preparation for welding, and use 18-8 stainless steel as a bonding material. Preheating and slow-cooling are necessary to produce a satisfactory tool.

Still another way of tipping is of course the long-established mechanical method—simply design a suitable recess in the shank and fasten the tip in place by a set screw or a bolt.

If you have a specific problem on "tipping," write to Bethlehem Steel Company, Bethlehem, Pa. We will be glad to give you help and advice without obligation on your part.

★ ★ BETHLEHEM STEEL ★ ★

STEEL
September 21, 1942
[redacted] Works Sets World Record in Plate Production
World record production of steel ship plates, more than enough for 35 Liberty cargo vessels, was achieved in August by [redacted] Works of [redacted] Steel Corp., a plant that had not rolled a plate until its conversion from sheet steel production five months ago. August tonnage exceeded the known plate output of any other plant in the steel industry, and was thousands of tons greater than the maximum estimated at the time of conversion.
Platemaking facilities at [redacted] were installed in 37 days and rolling of heavy-material was started April 17. Th
ion was speeded by use of
brought
CAPACITY

NEW PRODUCTION RECORDS ARE BEING ESTABLISHED WITH

TRABON LUBRICATING SYSTEMS

They eliminate downtime for lubrication . . . assure more productive hours per shift . . . and greater output

● You can "keep 'em rolling" hour after hour, and day after day, when your machines are equipped with Trabon Lubricating Systems,—because Trabon makes absolutely certain that every connected bearing receives just the desired amount of lubricant *while the machine is running.* You avoid costly downtime while a man crawls around lubricating each bearing individually,—and the breakdown if he misses one.

On costly steel mill equipment, overhead traveling cranes, forging machines, brakes, shears, and other machinery of every description, Trabon systems—for years—have been prolonging bearing life, minimizing machine tie-ups, reducing accident and compensation costs. For outstanding performance, specify and install Trabon Lubrication, and get the advantages of the many exclusive features only Trabon can give you. Manual or fully automatic operation. Send for our new fully descriptive Engineering Bulletins TODAY!

TRABON

ENGINEERING CORPORATION

1819 *East 40th Street* • *Cleveland, Ohio*

INDUSTRIAL LUBRICATION EXCLUSIVELY SINCE 1922

Cutting oil *News* letter

Practical suggestions from the field on how cutting oils and coolants are being used by midwest machine operators to lick tough wartime jobs.

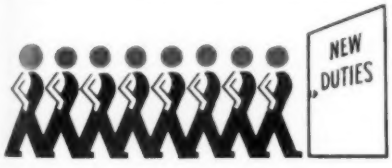
JULY, 1943

How longer tool life was obtained in making 250 lb. "practice" bombs

Operations by a stamping company on 250 lb. "practice type" bombs included drilling, reaming, tapping of the nose, cutting off tail end, and chasing an internal thread. Several oils failed to do the job right. Then the operator switched to Stanicool H. D. Soluble Oil (6 to 1 mixture); said it not only produced a better finish, but gave much longer tool life.

Bothered by Buildup on Dies? This was a real problem to a northwest manufacturer . . . on the male die on a deep draw job (6 in. deep) using 26 gauge steel sheets. Two parts Stanostamp "C" to one part water applied by swab ended this problem; also gave longer tool life at reduced cost.

Released 8 Men for Other Plant Work.



In producing 90 mm. anti-aircraft shells, a wrench manufacturer bumped into two headaches: (1) Use of high grade cutting oil at high surface speed and depth of cut caused excessive smoke, made parts too hot to handle. (2) Discoloration of the copper bands kept eight men busy buffing them. Working with plant operators, a Standard Lubrication Engineer selected a special soluble oil for this job. Last report was: perfect work coming through . . . no more rejects . . . the 8 men released for other work in the plant . . . ordnance inspectors enthusiastic.

Didn't ask for extra tool life but got it . . . as a bonus! The main idea in this plant was to lick the twin problems of 10% rejects and breaking along the edges when stamping radiator fins. Variation in hardness of material was the root of the trouble . . . which completely disappeared after changing over to Acme Base Oil Extra Heavy mixed 1 to 6 with paraffine oil. And to top it all off, a 40% increase in tool life has been secured.

How to Prevent Staining on Aluminum After Machining. Here's a practical suggestion that will interest many operators handling aluminum parts. In order to get away from staining and deposits on aluminum after machining, a battery and parts maker tried out a number of cutting oils. Final report is that Stanicut 62 FC was the only one to give full satisfaction. It is now standard for this operation.

OIL IS AMMUNITION . . . USE IT WISELY

World's Largest Planer Takes 6 Cuts At Once. A rolling mill and foundry company recently installed what was said to be the largest planer in the world. It has a table weighing 75 tons, carries a load of 300,000 lbs., takes six cuts at one time. Six barrels of Stanolex No. 31 were placed in the system for dependable lubrication.

Army Inspectors Give Entire Approval. A farm machinery manufacturer, in recently converting to war production, found it difficult to secure approval of finish and cleanliness of parts for plating after machining and tapping SAE 4150 steel. They started using Premier Cutting Oil No. 110 about 5 months ago, and army inspectors have given entire approval on workmanship ever since. More ease in cleaning parts for plating with this oil was a plus advantage.

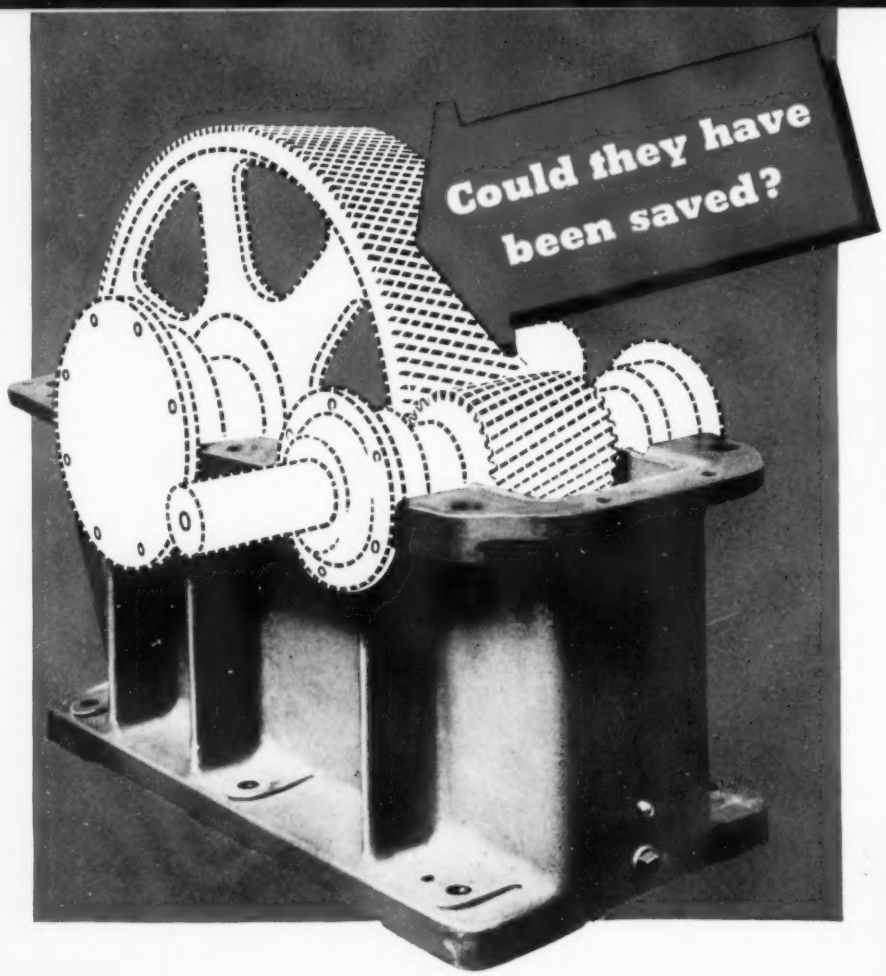
When You Bump Up Against Special Cutting Oil Problems

• If you are running into trouble in handling war work, and find it tough to get the necessary accuracy, finish, and tool life on converted machines . . . or if you have other perplexing machining jobs that a more efficient application of cutting oils may help answer . . . call in a Standard cutting oil specialist. Phone or write Standard Oil Company (Indiana) office, or 910 S. Michigan Ave., Chicago, Ill., for the Engineer nearest you. In Nebraska, contact any Standard Oil Company of Nebraska office.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

• LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICAT

LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATION E



Gear wear and what you can do to reduce it

GEAR WEAR is described by many terms—pitting, spalling, scoring, galling, scuffing—but by any name it all adds up to high maintenance, lost machine time, and replacement headaches.

Today, much of your power transmission equipment is operating at full-load—if not overloaded. That means, first, that more frequent inspections are needed, particularly on enclosed gears and bearings, to detect wear before serious damage is done.

Second, these new operating conditions may require more frequent lubricating schedules or even new types of lubricants. It's a good time to check these points thoroughly before they show up in excessive wear.

Signs of gear wear, and the cause, are easily recognized in many instances. A few are pictured and described at the right. But determining the cure is not always simple.

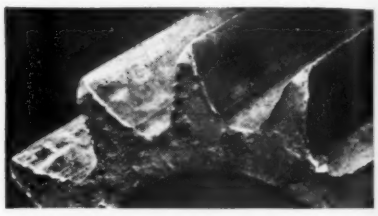
Why not do the whole job at once—check equipment for excessive wear, check lubricating schedules and lubricants—by having a Standard Lubrication Engineer help you make an inspection of this equipment. He has done this in other plants and has made many valuable suggestions. It will take very little of your time and will cost you nothing. Call any local Standard Oil Company (Indiana) office, or write 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you. In Nebraska, call any Standard Oil Company of Nebraska office.

OIL IS AMMUNITION . . . USE IT WISELY

Typical examples of gear wear

Pitting is of two types: (1) Corrective pitting—occurs when gears are first operated, caused by high spots in gear finish. When high spots are eliminated pitting stops. (2) Destructive pitting, illustrated above—occurs when pitting continues until the contacting surfaces are destroyed.

Watch for signs of pitting on new gears. Prevent it from reaching the destructive stage by truing up contact surfaces and applying more effective lubricant.



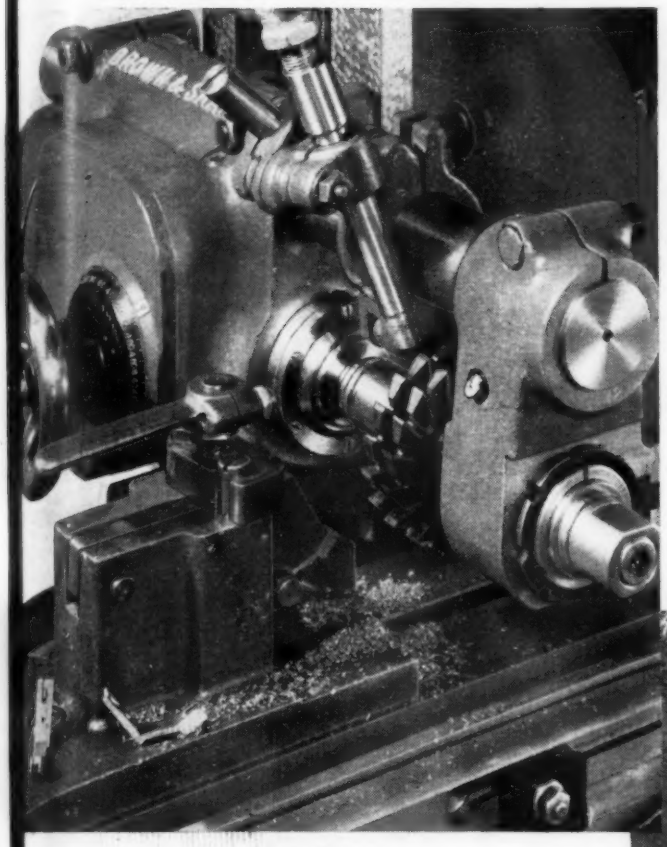
Abrasion: Generally distinguished by radial scratches on the teeth. In enclosed gears, use greater care in handling lubricants and filling gear cases to prevent entrance of grit and dust. On open gears in dusty conditions, use non-sticky gear compound to reduce abrasion.

Scoring and galling: Different degrees of the same type of wear. Scoring is scratching, grooving, or roughening of tooth surface. Galling, shown above, is seizing or tearing of the surface as the result of continued scoring. Causes: Excessive pressures, rough surfaces, foreign matter, or inadequate lubrication. Analyze any scoring, and correct it before galling occurs.

These are but a few examples. A Standard Lubrication Engineer can help you determine the cause of many types of gear failure and suggest ways to prevent them.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

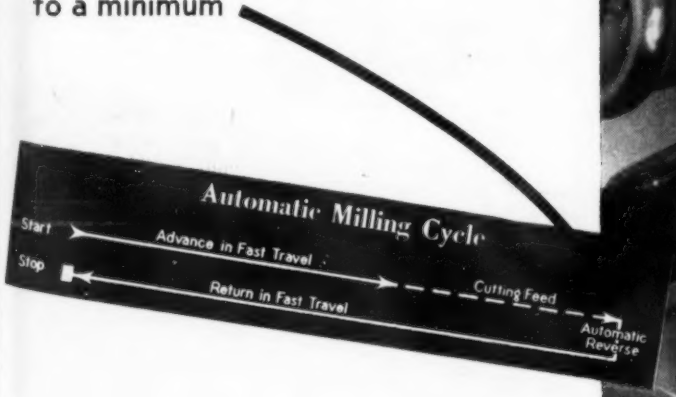
USE THE ACCURACY OF TABLE REVERSAL
— step up small parts milling on your № 000's

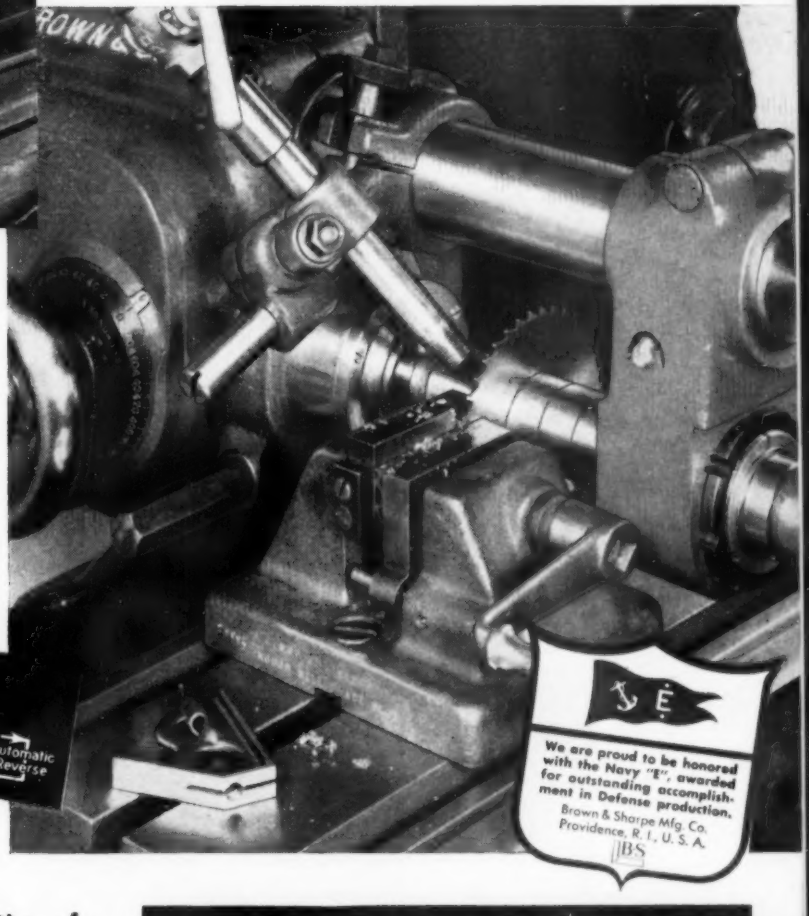


Consistent reversal of the machine table within an accuracy of .002″ gives the equivalent of a positive stop. This is ideal for blind cuts where accurate table reversal is essential.

And — the precision adjustment of the table to position the work when setting up is a time-saving feature.

Take advantage of this accuracy of reversal on **every** job and reduce non-cutting time to a minimum




We are proud to be honored with the Navy "E", awarded for outstanding accomplishment in Defense production.
Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.
BS

Make **full** use of the production possibilities of the No. 000 Plain Milling Machine for the rapid milling of small parts on a wide variety of materials.

DELIVERIES ARE GOOD
on New No. 000 Plain Milling Machines

BROWN & SHARPE

Today... Tomorrow... Favorite Tools

In War or Peace—

Black & Decker Tools "come through" when time is precious, production demands heavy. At this converted plant, the same powerful Portable Grinders smooth welded joints of four-ton oxidizing tanks (shown here) or finish armor plate for Uncle Sam.

Sanding On metals, wood or plastics, husky Black & Decker Tools help speed all kinds of war equipment. Here a Black & Decker Heavy Duty Sander finishes plywood plane fuselage after heat and pressure mold it into correct shape.

Tapping Black & Decker Tapgun is used for tapping threads on 'round the clock production of 3" shell boxes. Plant operator reports big time saving since he "tooled up" with Black & Decker equipment for all sorts of production jobs.

# of War Industry
Backbone of Postwar Production

☆

HERE are typical reasons why over half of America's war plants today count on Black & Decker Portable Electric Tools to help keep production humming. Jobs such as these are reasons, too, why industrial "post-war planners" will count heavily on the skill and leadership of Black & Decker engineers for tools to turn out "peacetime" products faster and better.

From war producers come such reports as: "Black & Decker Lectro-Shears do the work in one-third the time formerly required" . . . "These Drills, Saws and Sanders lessen fatigue, raise production quality at our boat yard" . . . "Black & Decker Scruguns take lots of abuse from inexperienced workers—but *really hold up*" . . . "We changed to Black & Decker because of your prompt parts and repair service—and the tools are more dependable" . . . "Your Drills helped solve tough wartime problem for us" . . . "Never lost a minute due to tool breakdowns . . ."

These reports—and many more like them—reflect war industry's attitude towards Electric Tool Headquarters in today's terrific production pace. The *complete* line of Black & Decker Electric Tools, the engineering "know-how" back of them, the coast-to-coast Factory Branch service facilities, the Distributors everywhere who offer expert help and tool information—these are the reasons why you can depend on war industry's favorite tools in your postwar planning. The Black & Decker Mfg. Co., 716 Penna. Ave. Towson, Md.

LEADING DISTRIBUTORS ARMY E NAVY EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS

Drilling Unusual drilling operation on frame of PT boat, details of which can't be disclosed. Whatever the operation, Black & Decker Heavy Duty Drills are indispensable for high speed, continuous production jobs in all boat yards.

Nut Running

Black & Decker Positive Clutch Nut Runner, used here on track shoe bolts of tractor, is a *must* when war producers require high speed nut running or stud setting operations.

7 times as many Bombs

MACHINED BETWEEN TOOL GRINDS WITH TYCOL SOLUBLE OIL!

Here's another striking example of how Tycol quality cutting oils are stepping up production:

A big ordnance plant producing 2000-pound aerial bombs was getting unsatisfactory tool performance. Tools had to be reground after machining every 3 bombs. Then they switched to Tycol 678 EP Soluble Oil and an immediate improvement resulted. Now 21 bombs are machined between tool grinds—a sevenfold improvement!

Such performance is typical of many cases where Tycol cutting oils are saving time and trouble and increasing production. Whether the job is boring giant gun barrels or tapping tiny nuts, there's a Tycol cutting oil "engineered" to do the job.

A Tide Water engineer can help you select the Tycol oil best suited to your specific requirements. Call him today—his services are available without obligation.

MAKERS OF THE FAMOUS VEEDOL MOTOR OIL
EASTERN DIVISION: 17 BATTERY PLACE, NEW YORK 4, N. Y.

OIL IS AMMUNITION

TIDE WATER ASSOCIATED

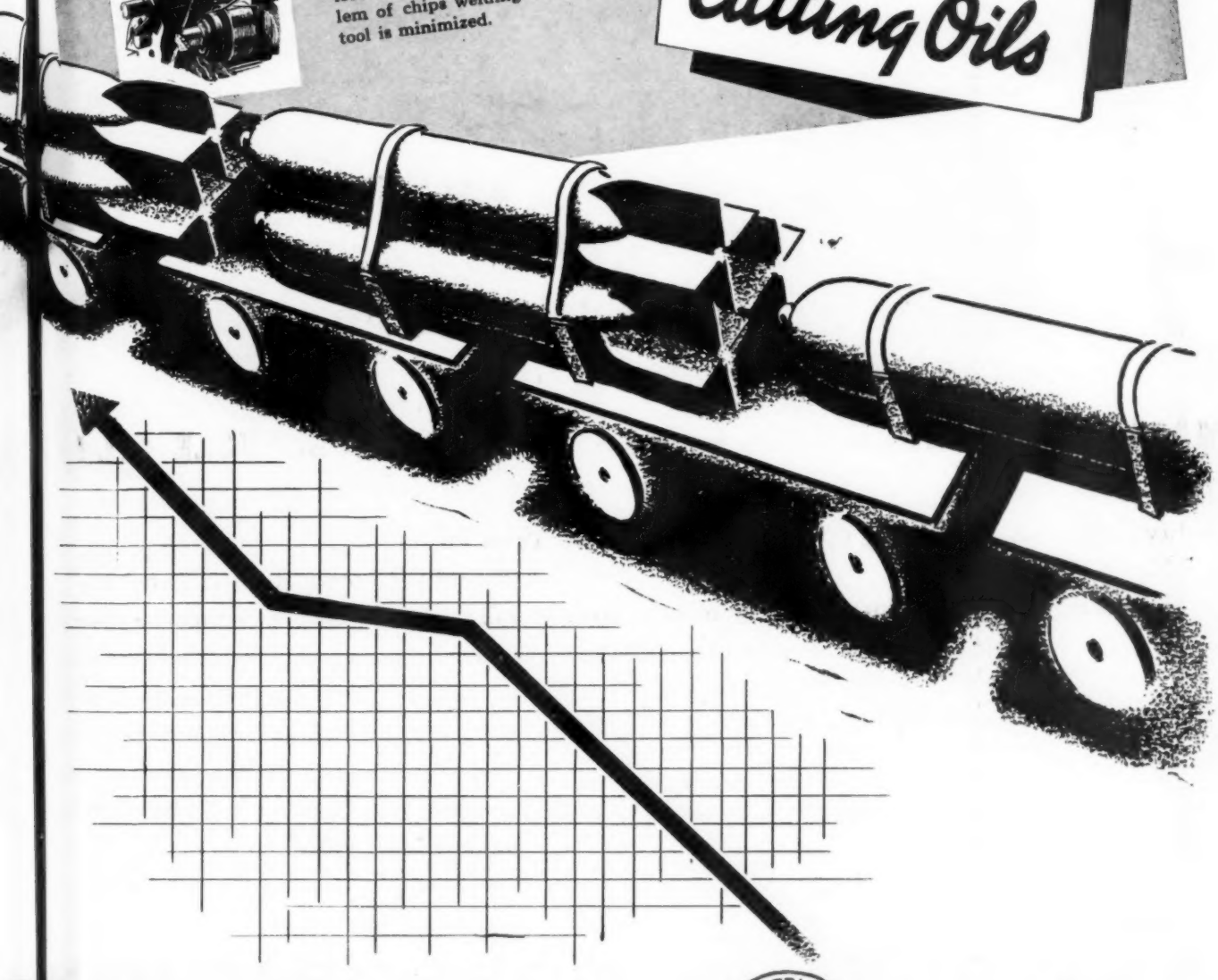
Principal Branch Offices: Boston, Philadelphia, Pittsburgh, Charlotte, N.C. • TIDE WATER OIL COMPANY OF CANADA, LTD., Toronto—Montreal

FASTER CUTTING—The better cooling and lubricating job performed by Tycol Transparent Sulphurized Cutting Oil is saving time and material and achieving greater output even on the toughest steels.

FINER FINISHES—Tide Water Transparent Cutting Oil is unique among sulphur base cutting oils because it does not tarnish the work. This important advantage tells why thousands of machine tool users insist on Tycol.

LONGER TOOL LIFE—Tools that work under Tycol Cutting Oil have a longer productive life. Regrindings are less frequent and the problem of chips welding to the tool is minimized.

with **TYCOL** *Cutting Oils*



OIL COMPANY

INDUSTRIAL TYCOL OILS-GREASES

DRUMS! DRUMS! DRUMS!

War needs make it extremely important that all empty drums be returned immediately.

America's finest complete service

to the Plating, Polishing and Anodizing Plants

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Part of Udylite's design and layout department where you may obtain the advice and assistance of experienced metal finishing engineers.

This is the laboratory where all Udylite products are developed and constantly tested under actual plant operating conditions.

UDYLITE has everything for the metal finishing plant. An Engineering Staff with years of practical experience to assist you in laying out your new plant or improving the efficiency of your present one.

Equipment for every need, that has proved its dependability in actual service records.

A very complete list of supplies second to none in quality. If you have a metal finishing requirement or a tough problem bring it to Udylite. Our experienced engineers and electro-chemists are at your service. Your inquiry will be handled promptly and efficiently.

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1943 Walnut Street

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11-16, 44th Drive

Cleveland
4408 Carnegie Ave.

★WPB ORDER M-24C REQUIRES YOU TO

Classify Scrap at the Source-

SEGREGATE INTO THESE OFFICIAL CLASSIFICATIONS:

1. Nickel Steels (Ni 1%-2%) and Nickel-Chromium Steels (Ni 1%-2.25%) as 2100, 3100, 3200 series
2. Nickel Steels (Ni 2%-5.25%) as 2300, 2500
3. Nickel-Chromium Steels (Ni 2.25-5.25%) as 3300, 3400
4. Nickel-Molybdenum Steels (Ni 1-5.25%) as 46-4800
5. Ni Cr Moly Steels (Ni 1% and under) as 86-87-88-8900
6. Ni Cr Moly Steels (Ni 1%-5.25%) as 4300
7. Molybdenum Steels (Moly 0.15-0.65%) as 4000, 4100, 80-81-82-83-84-8500
8. Molybdenum Steels (Moly over 0.65%) as Mn-Mo Bullet Core
9. Chromium Steels and Chromium-Vanadium Steels (Cr 0.70-1.75%) as 52100-5100-6100

TOOL STEELS 10. Class A High Speed Steels (containing [1] at least 0.60% carbon and 3.0% Moly or [2] at least 0.60% carbon, not over 7.0% tungsten and at least 3.0% molybdenum) 11. Class B High Speed Steels (at least 0.55% carbon and 12% tungsten 12. Tungsten-bearing Hot Work Steels

CORROSION AND HEAT RESISTING 13. Chromium 10-14% inclusive 14. Chromium 15-18% incl. 15. Chromium over 18%. 16. Chromium 16-20% incl. and Nickel 8-10% incl. 17. Chromium 21-30% inclusive. Nickel 11-20% inclusive. 18. All other grades of corrosion and heat resisting alloy irons and steels containing chromium, nickel, molybdenum, cobalt, or copper.

Segregating scrap, as required under WPB Order M 24 C, is a difficult task, but it is absolutely necessary — there is no alternative. Production of fighting equipment made from alloy steels must not bog down.

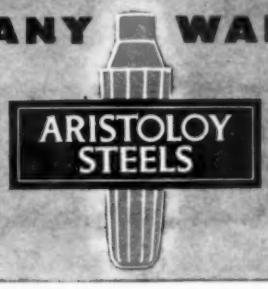
War has shut the door on many sources of supply for essential elements, such as chromium, vanadium, nickel, which put the "fight" in steel. As a result, most of the alloys must be redeemed from the steel itself. For instance, in the manufacture of a precision part of an airplane, only 20 per cent of the original steel ingot is actually used. The other 80 per cent becomes scrap in the form of turnings and other by-products of the various machining and finishing operations.

Recovery of the essential alloys from machine turnings, chips, etc., would be comparatively simple if the elements could be separated in the furnace, but this is impossible. Scrap of unknown analysis may not only mean waste or loss of the alloys, but may ruin an entire heat of steel. Properly classified scrap saves alloying materials as well as manufacturing time.

To make enough alloy steel for the demands of war, scrap must be segregated and identified by the specific classifications outlined by the War Production Board. The only way this job can be done is at the source—your machines where the scrap turnings are produced. If you have not already done so, we urge you to review your shop procedure on the handling of scrap.

COPPERWELD STEEL COMPANY WARREN, OHIO

AIRCRAFT QUALITY STEELS · NITRALLOY STEELS
STAINLESS STEELS · BEARING QUALITY STEELS
CARBON TOOL STEELS · ALLOY TOOL STEELS



Serving and Conserving —

DOING *TWO* VITAL WAR JOBS . . . RUSTLESS is proud that it has the facilities and the "know-how" to do two war jobs of singular importance.

First, we are producing more Stainless Steels than any other plant in the nation. That is because we are the only plant whose entire resources are devoted to making this one, vital, strategic material and nothing else. Already Stainless Steel's exceptional properties of high tensile strength and remarkable resistance to corrosion by heat, acid and rust have made it a must in the production of the most vital war equipment.

Second, the unique **RUSTLESS** processes are conserving two metals that are critically scarce. These metals . . . Chromium and electrolytic Nickel . . . are essential, not only for the manufacture of Stainless Steel but for many other war requirements as well. **RUSTLESS** has largely "by-passed" their use by the discovery of ways to achieve equal results through the use direct in the furnace of ores and through the recovery of stainless steel scrap, both of which are in ample supply.

Thus, **RUSTLESS** is both *Serving* and *Conserving;* two jobs that we will continue to do with all our might and with all our resources throughout the war and in preparation for the peace to come.

BUY U. S.
WAR BONDS
AND STAMPS

ARMY E NAVY

RUSTLESS

CORROSION AND HEAT-RESISTING
STAINLESS STEELS

RUSTLESS IRON AND STEEL CORPORATION • • • BALTIMORE, MARYLAND

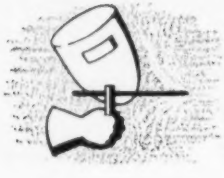
Kool Pore

. . . for heavy cuts and fast removal of metal without burning. These BAY STATE highly porous and cool cutting grinding wheels for TOOL AND CUTTER and SURFACING jobs can't be beat! Try them.

BAY STATE

ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

PAGE *Welding* ELECTRODES



Of course **PAGE** developed a new electrode for welding armor . . . Important as that may have been to tank production, it is just as vital—to those who weld Stainless Steel—that **PAGE** also developed a *complete* range of electrodes for this purpose. In fact, no matter what Stainless Steel you are welding, **PAGE** can supply you with electrodes that deposit, in the weld, metal that equals the Stainless you are using. That is something worth checking into with **PAGE.**

PAGE STEEL AND WIRE DIVISION

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AMERICAN CHAIN & CABLE COMPANY, Inc.

BRIDGEPORT • CONNECTICUT

ESSENTIAL PRODUCTS . . . TRU-LAY Aircraft, Automotive, and Industrial Controls, TRU-LOC Aircraft Terminals, AMERICAN CABLE Wire Rope, TRU-STOP Brakes, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Castings, CAMPBELL Cutting Machines, FORD Hoists, Trolleys, HAZARD Wire Rope, Yacht Rigging, MANLEY Auto Service Equipment, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Electric Steel Castings, WRIGHT Hoists, Cranes, Presses . . . *In Business for Your Safety*

In the tight spots it's a STAR

POWER PACKAGED AS YOU NEED IT

Barrett-Cravens' revolving portable crane illustrates Star's ability to accommodate varying HP needs to frame-space limitations. Through its welding process—and through its specialized engineering service—Star provides "tailored" ½ to 2 HP motors meeting Barrett-Craven requirements to a "t", without the necessity of special molds and castings. Each motor is self-braking. Just another example of Star performance which combines the flexibility of specialized application and specialized engineering with the obvious advantage of standardized design. Star Electric Motor Company, Bloomfield, N. J.

For 33 years Star Motors have provided a complete line of standard as well as specialized motors—in sizes from ½ to 200 HP. Today they are providing dependable power for hoisting and many other industries. Write us about your requirements.

STAR MOTORS

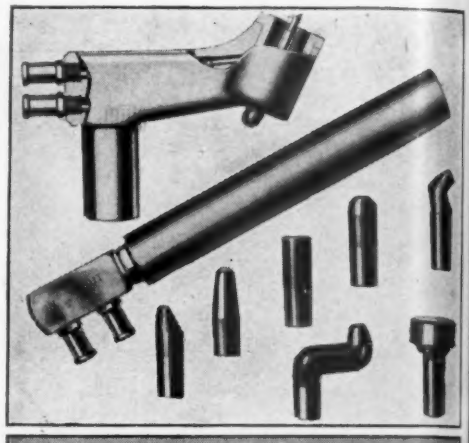
How To Make Resistance Welding Electrodes Last Longer

1. Use internal water cooling wherever possible. Properly cooled electrodes have a higher electrical conductivity and carry the welding current to the work efficiently. By specifying water cooled resistance welding electrodes of the correct size, design and material for each job, you can largely eliminate "mushrooming", sticking and metallic pick-up. You can get more welds per electrode . . . speed output . . . and produce sounder welds.

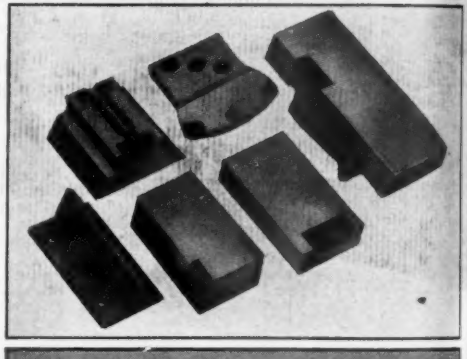
2. Use correct dressing technique. For instance, spot welding tips should be machined to the correct welding face on a suitable lathe. Or tips may be dressed accurately and rapidly, without removal from their water-cooled holders, by using the Mallory Tip Dresser . . . a simple hand tool that machines top and bottom electrodes simultaneously. All resistance welding electrodes need reshaping after long runs, to restore the correct welding face.

3. Clean electrodes at frequent intervals with an abrasive cloth, using light pressure. Tips, welding wheels, dies or mandrels that are contaminated . . . with iron particles, for instance . . . are apt to become "burned" or pitted. Regular cleaning while electrodes are in the welding machine will prolong their life and assure better welds.

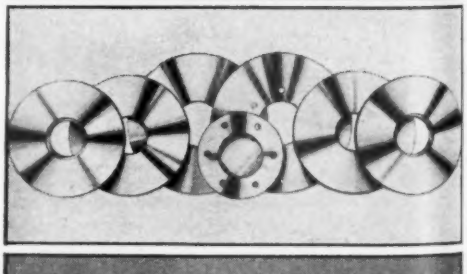
TECHNICAL SUGGESTIONS on specifying and taking care of resistance welding electrodes . . . whether you're fabricating ferrous or non-ferrous metals . . . are yours for the asking from Mallory. Get the help of our engineers, who have pioneered for many years in improving resistance welding practice. Write us today . . . If you'd like a free copy of the factual MALLORY RESISTANCE WELDING DATA BOOK for your technical library, just mention it in your letter.



SPOT WELDING TIPS AND HOLDERS



FLASH, BUTT, PROJECTION WELDING DIES



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P. R. MALLORY & CO., Inc.
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Speedier Production
Less Down Time
Better Welding • Lower Cost

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STANDARDIZED RESISTANCE WELDING ELECTRODES

IN AMERICA'S GREAT PRODUCTION PLANTS..

In the great plants of the Link Belt Company, batteries of Acme-Gridley Automatics turn out endless streams of precision parts for Ordnance and Ammunition.

Better ammunition-QUICKER!

IT IS AN UNCENSORED FACT that our armed forces pack more fire power than the enemy, and use it more effectively.

Acme-Gridley Automatics are helping to produce the better guns and better ammunition that point the way to Victory through superior marksmanship and "more hits."

These modern automatic machines maintain accuracy at high speeds. They produce faster. They often combine many intricate operations into one—to save time and reduce costs.

The effective production work of Acme-Gridleys will be equally effective in turning out—at new low costs—the improved goods on which peacetime prosperity must be based.

THE NATIONAL ACME CO.

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ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

HELPING THE Aircraft Industry
DO MORE THAN
THE EXPECTED*
WESSON
Carbide Cutting Tools
If it's tough metal, you'll want Wesson Carbide Cutting Tools
—for special or standard jobs—for single or multiple setups.
*More than the expected? Right! Today our Aircraft Industry is out in front — ahead of schedule — and the biggest production job ever tackled by any industry is practically "licked."
Pioneering, meeting every challenge, Wesson Carbide Cutting Tools have helped to make this possible — by making short work of extra precision jobs on toughest metals and alloys — with fewer setups, greater speed, bigger bites, and a minimum of rejects.
The new metal cutting standards set by Wesson in aircraft motor production will be the "yardstick" of performance for machine tools of the future. . . The counsel of Wesson engineers — skilled in engineering and designing of cutting tools — is available to help solve present war production problems, or for post-war planning.
WESSON CO., DETROIT, MICH. (Ferndale Station)

IN HAPPIER DAYS TO COME we will all have better, safer automobiles — more efficient refrigerators, washing machines and vacuum cleaners . . . . farmers will have better, stronger tractors and other tools and machines . . . . aircraft will continue to set new standards in speed, comfort and safety . . . . all made possible, in part, by the Wesson development of Carbide Cutting Tools to such high standards that they cut tougher metals than ever before — with greater precision — and at greater speed.

Wide Range of Low Driving Speeds

in a Single, Compact Variable Speed Unit...

The New REEVES *Reducer-Type* TRANSMISSION

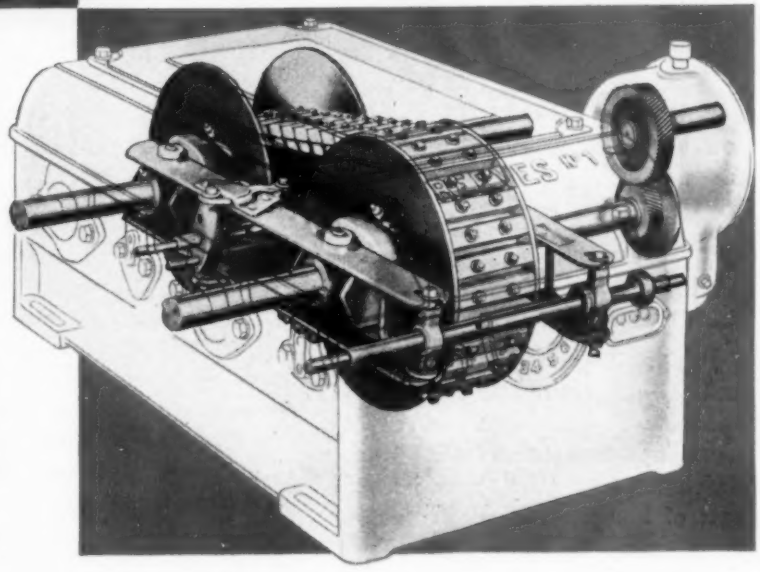
The REEVES Variable Speed Transmission —industry's widely preferred unit for providing accurate, instant speed adjustability—is now available with built-in, helical-type speed reducer.

With this new REEVES drive, speed adjustability and reduction are secured, without the use of other auxiliary speed reducing equipment, and the operator of any production machine has a wide range of low driving speeds instantly available in a single compact unit.

The REEVES Reducer-Type Transmission is offered in two completely enclosed designs—horizontal and vertical—each available in many different horse power capacities and ranges of speed variation. Both designs are highly adaptable and may be mounted in most any position to meet individual installation requirements.

It is easy to equip either design for individual motor drive by use of the REEVES adjustable motor base, as pictured above, which accommodates any available motor. Send for full details. Use handy coupon below.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA



"X-ray" view showing how reduction gears are mounted on the variable speed shaft of the Transmission, this shaft serving as the input shaft for the reducer unit.

REEVES *Accurate-Variable* SPEED CONTROL

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Send copy of 16-page Catalog ATR-432 giving complete engineering information on the new REEVES Reducer-Type Transmission.

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INDIVIDUAL.....ADDRESS.....

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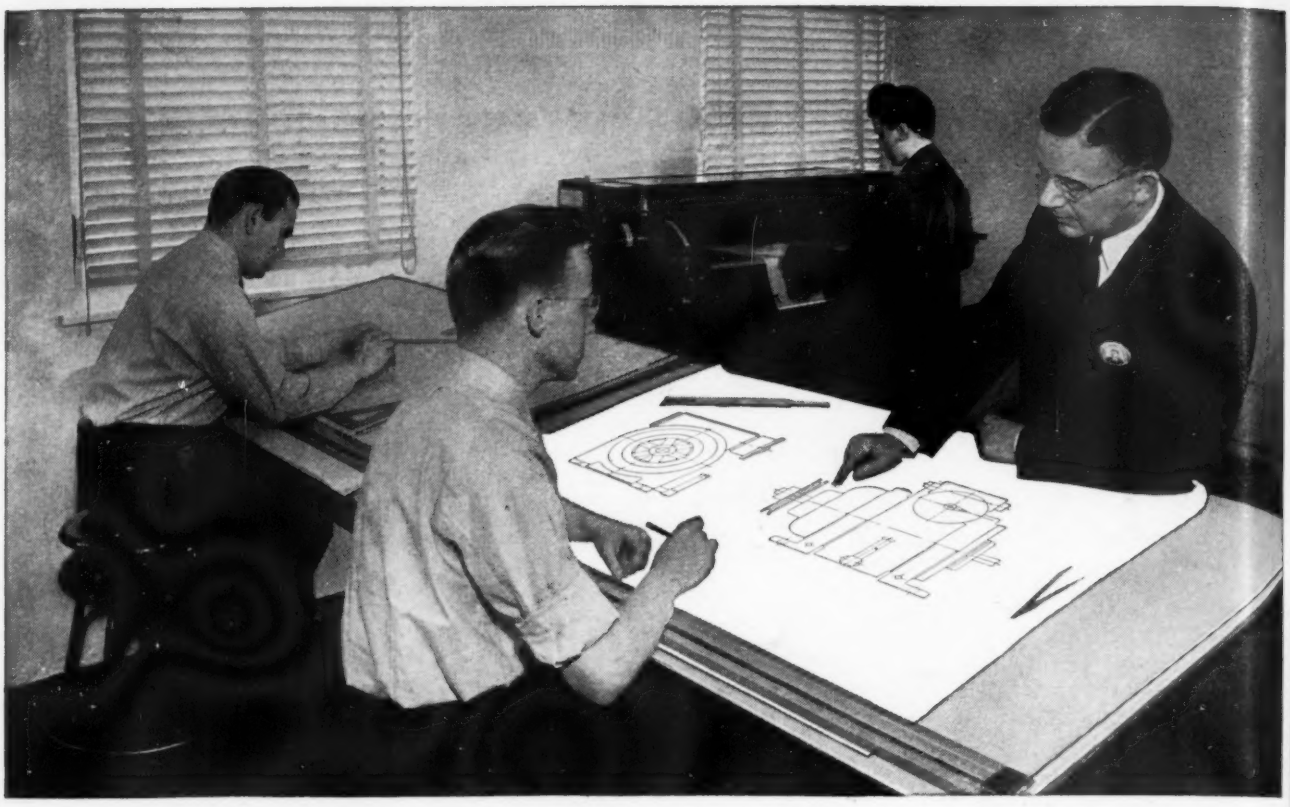


Why Ozalid clicks with engineers and draftsmen

STUDY THE cross-sectional drawing of an Ozalid Whiteprint Machine . . . It tells much of the story.

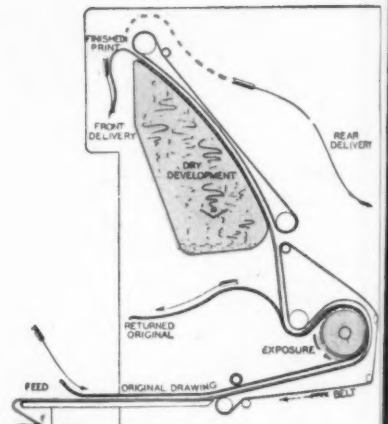
Printmaking is reduced to two operations—Exposure and Dry Development . . . the liquid baths, the plumbing connections, the driers which for fifty years have been a part of blueprinting *are eliminated.* SIMPLIFIED PRINTMAKING allows simplified design—and an Ozalid Machine is so compact that it may be installed right in the drafting room where it can be operated by anyone.

What's most important now, though, is the fact that the Ozalid Process saves thousands of man-hours . . . and that means a big "head start" in war production. When you want to change part of a drawing, it's never necessary to redraw any line which remains the same in the new design. You merely make a transparent print of the original tracing . . . delete the obsolete lines with a corrector fluid . . . and draw in the new design. It's that easy—no Van Dyke tieups, no photographic equipment required.

Ozalid Whiteprint Machines are designed for large scale, medium, and occasional print production. Adopt Ozalid . . . and make positive reproductions *direct* from *your* engineering drawings, charts, and letters.

WRITE FOR "SIMPLIFIED PRINTMAKING."

It shows how leading manufacturers save time, labor, and materials with the Ozalid Process; also contains samples of whiteprints having blue, black, and maroon lines on white backgrounds.



Cross section of Ozalid Model "B." For large scale production; top speed 20 feet per minute; front or rear print delivery; many new features.

OZALID PRODUCTS DIVISION

GENERAL ANILINE AND FILM CORPORATION

Johnson City, N. Y.

Debunking *Globaloney*

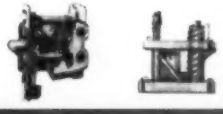
ABOUT "UNIVERSAL" OVERLOAD RELAYS

There is no universal overload relay which will provide complete motor protection under all extremes of temperature found on the globe. A variety of thermal elements is needed for universal overload protection.

Therefore a simple type of relay, like the Allen-Bradley resisto-therm, will satisfy 98% of industrial requirements. Only where a starter is subjected to very wide temperature changes does the universal (compensated) relay offer tangible advantages. Such installations are not an everyday problem . . . hence, the relay with the fewest parts . . . like the A-B resisto-therm . . . is the ideal overload relay.

The following table presents a picture of overload relay performance under various atmospheric temperature conditions. Whether you use resisto-therm or "universal" relays, you must analyze installation conditions and select the correct thermal element for reliable motor protection.

HOW TO SELECT THE OVERLOAD RELAY FOR BEST PROTECTION UNDER VARIOUS TEMPERATURE CONDITIONS



Atmospheric temperature at motor	Atmospheric temperature at starter	Relay
NORMAL	NORMAL	Specify resisto-therm relay because of its simplicity. "Universal" type contributes nothing toward improved protection.
Considerably ABOVE NORMAL (A very common condition)	NORMAL	Specify resisto-therm relay. "Universal" relay may permit motor to reach a dangerous temperature, because it operates on current only and does not consider effect of high atmospheric temperature in which motor is operating.
Considerably BELOW NORMAL	NORMAL	Specify resisto-therm relay because it permits motor to carry any safe load but protects it against overheating. "Universal" relay, operating on current only, will not permit motor to do a wartime job.

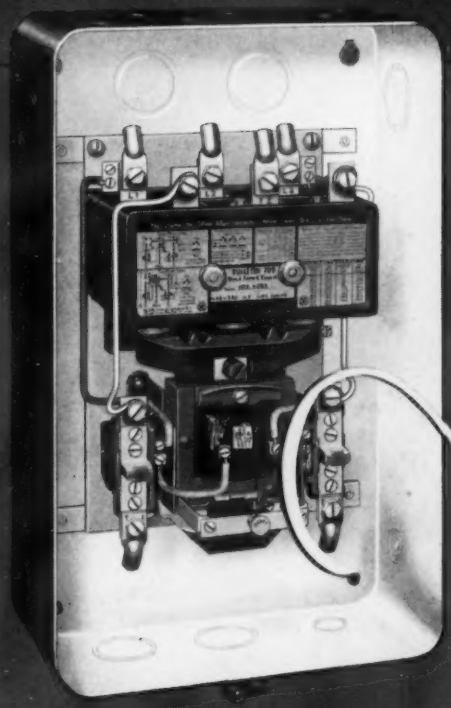
A-B

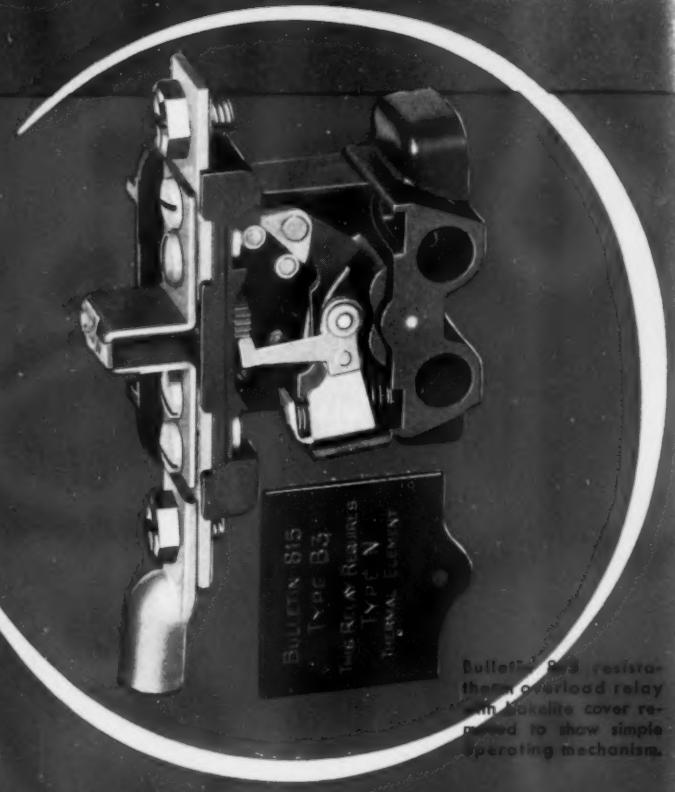
ALLEN-BRADLEY

OVERLOAD RELAYS

QUALITY

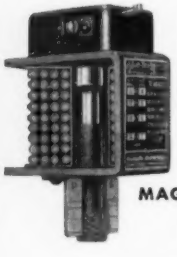
PROTECT YOUR MOTORS
with simple but reliable relays





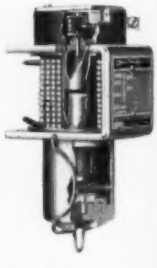
Bulletin B-3 resisto-therm Overload relay with bakelite cover removed to show simple operating mechanism.

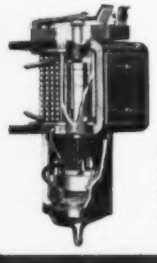
FOR HIGHER CAPACITIES



INDUCTO-THERM TYPE
Cross-section of Bulletin 820 overload relay, adjustable over a wide range of tripping values. Used with the larger motor starters.

COMBINATION MAGNETIC INDUCTO-THERM TYPE
Bulletin 821 overload relay combines advantages of magnetic and inducto-therm relays for high tension starters.





MAGNETIC TYPE
Bulletin 810 overload relay, showing dashpot construction, is ideal where motors are liable to stall.

The thermal overload relay, used with all A-B solenoid starters, is of remarkably simple design.

This relay will provide reliable motor protection under all operating conditions requiring only that the heater element be the correct one for the specific installation.

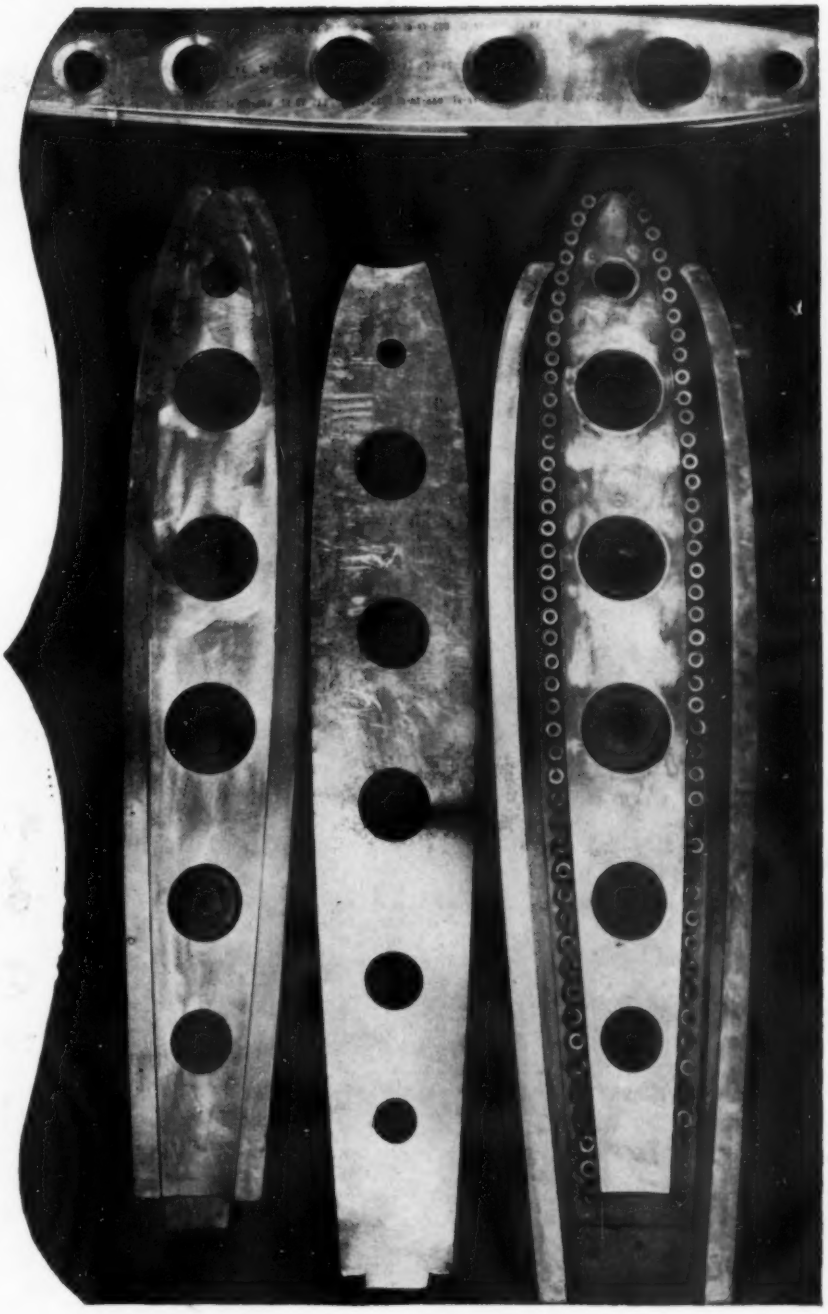
Allen-Bradley resisto-therm relays operate on the soldered ratchet principle. The relay ratchet is soldered to a stem surrounded by a thermal element. A sustained overload on the motor heats up the thermal element which melts the eutectic solder. The ratchet is then free to turn and opens the silver alloy, double break relay contacts. This opens the coil circuit of the switch and disconnects the motor from the line.

Give your motors reliable overload protection by installing Allen-Bradley solenoid type starters . . . they all have two resisto-therm relays. You get not only safe overload protection, but millions of trouble-free starter operations. The double break, silver alloy contacts never need any maintenance. There are no pins, pivots, hinges, flexible jumpers, or bearings to break, stick, or corrode. Write today for Bulletin 709.

Allen-Bradley Company, 1316 S. Second St., Milwaukee, Wis.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

SAVE TIME · MONEY · STEEL



• This photo shows how Masonite Die Stock was used by Schlenzig Manufacturing Company, Philadelphia, to build a six-foot-long stabilizer rib mating die.

MANUFACTURERS all along America's wartime production front are saving time, money and steel by using Masonite Die Stock for special types of mating dies, forming blocks, templates, jigs and fixtures.

This amazing semi-plastic material has great compressive and flexural strength . . . stands up under present-day production requirements . . . can be fabricated in pattern or metal shops with great speed . . . saves manufacturers precious time in tooling up and getting into production.

Only one-sixth the weight of steel, Masonite Die Stock produces dies, forming blocks, jigs and fixtures that can be easily handled in and out of hydro press or power brakes, etc., by either men or women—hoists or cranes are seldom required. To conserve steel for the vital purposes of guns and ships—to do a faster job at lower cost—investigate this remarkably efficient and economical material today.

Masonite Die Stock is available in thicknesses of ¼ to 4 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For greater thicknesses, this material can be laminated with cold setting Urea-Formaldehyde glues. To learn more about Masonite Die Stock, please mail coupon below.

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MASONITE CORPORATION, *Dept. AM-7,* 111 West Washington St., Chicago, Ill.

Please send me illustrative literature and complete information about Masonite Die Stock.

Name and Firm _____

Address _____

City _____ *State* _____

The Gestapo would kill to get this information

It's yours simply for the asking!

TO you men, who are today using steel in a hundred new ways —who must perform the veritable miracles of production upon which the success of our war effort depends—to you we offer practical assistance in the use of steel that will make your job easier.

Here for *your* use are the very latest wrinkles in the wartime application of steel that keen metallurgical skill and American manufacturing ingenuity have developed.

Much of this information is of such a "hush-hush" nature that we dare not be specific here. But this we can say—most of it is based on the solution of knotty problems in war production such as you face every day, and therefore should be of inestimable help to you.

Closely guarded in our confidential files are actual case histories that will help you short-cut your fabricating processes—that will make steel do more for you than it has ever done before, or do it better.

Here is the kind of information that Axis agents would stop at nothing to get their hands on.

It is our responsibility to see that this information is distributed where it will do the greatest good. It is your responsibility to use it to America's advantage.

ONE AIM . . . VICTORY . . . BUY BONDS!

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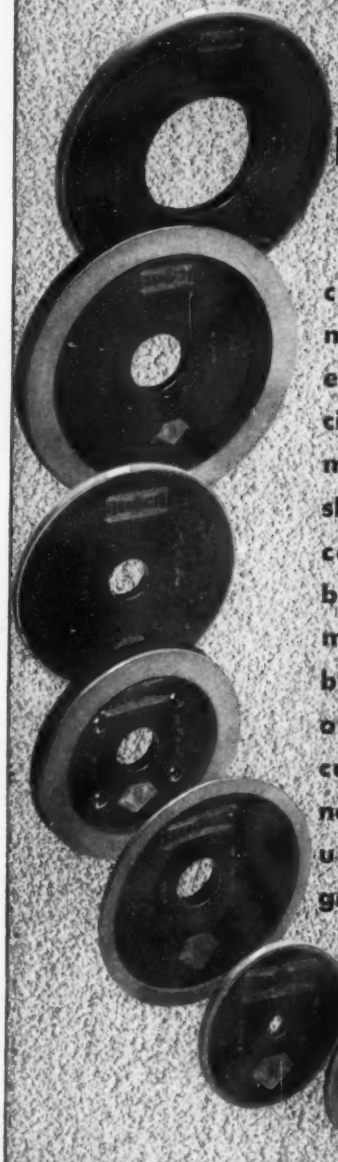
Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

UNITED STATES STEEL

USS

SECOMET



DIAMOND WHEELS

can do your work more accurately, faster and without appreciable wear. They are most economical for sharpening cemented carbide and multi-blade tools, such as milling cutters, broaches, etc. Moreover, their sharp, free-cutting action eliminates lapping and the usual semi-finish grinding operation.

J. K. SMIT & SONS

157 Chambers St., New York, N. Y. 6400 Tireman Ave., Detroit, Mich.

If You Use a

SEPARATE SOLDERING FLUX

You'll Get Better Results with KESTER

- Kester Soldering Fluxes—salts, paste or liquid—are made with scientific care to meet the most exacting production requirements. They're compounded to give maximum fluxing results, and they've proved their efficiency over and over again in the 44 years they have served industrial users.
- For example, Kester Soldering Paste is made by the viscosiforming process, which makes it uniform in fluxing quality. Fluxing ingredients are evenly and finely divided.
- Whatever form of flux you use, look for quality and best results to the same experience and laboratory skill that have made Kester Cored Solders standard for every industrial use.
- When ordering fluxes, *specify* these Kester products:

Kester Viscosiformed Paste
Kester Trichloron Salts
Kester Soldering Liquids
Kester Superchloron Tinning Blocks

KESTER SOLDER COMPANY
4223 Wrightwood Avenue, Chicago, Illinois
Eastern Plant: Newark, N. J.
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KESTER
Cored Solders
STANDARD FOR INDUSTRY

№ 170 TYPE DEOXIDINE

For GREATER EFFICIENCY

in Preparing Steel and Aluminum Ordnance Parts For Varnish and Paint Finishes...

DEOXIDINE #170, admirably suited to the processing of steel shell cases, is but one of a number of grades of ACP acid cleaners. The immersion process in which it is used is adaptable to the cleaning of many other ordnance or marine parts. Other grades of DEOXIDINE are available for brush or spray processes where these are indicated for expediting production.

DEOXIDINE #170 is a chemical that removes light oil, annealing scale and eradicates rust and rusters, producing a clean, minutely-etched, paint-receptive surface. The rusters, even though invisible, are destroyed, eliminating the possibility of defects developing beneath the protective finish. DEOXIDINE does not produce a coating on the cleaned surface which on shell cases, for example, might crack in crimping and in obturation and ruin the protection of the final finish.

DEOXIDINE meets U.S. Ordnance Department requirements for its efficiency in removing rust and neutralizing rust producers before protective finishes are applied.

CHEMICALS ACP PROCESSES

Manufacturers of Inhibitors & Metal Working Chemicals

AMERICAN CHEMICAL PAINT CO.
AMBLER ACP **PENNA.**

Send today for Deoxidine #170 Pamphlet showing how simple it is to use.

Name _____

Position _____

Firm Name _____

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M-7

TURCO PRESENTS

REDI-PAINT

THE 226TH ANSWER TO WAR PRODUCTION SPEED-UP

When the war demanded greatly accelerated manufacturing processes, TURCO already had 225 time-saving products and processes available to industry. Now TURCO presents REDI-PAINT, the 226th industrial helper.

REDI-PAINT renders galvanized surfaces passive, makes them receptive to organic finishes, and permits close bonding with the basic surface.

4 REASONS TO USE REDI-PAINT

1. Speeds production by its easy application.
2. Back-tracking eliminated because of the easily distinguishable gray color on galvanized materials.
3. Rapid drying permits quicker handling for further processing.
4. Protective copper film prevents pin holes or peeling after painting.

Technical service men in key cities everywhere. Fill in the blank below for further information on Turco Redi-Paint.

TURCO PRODUCTS, INC.

Los Angeles — Chicago
Main Offices & Factory — 6135 S. Central Ave., Los Angeles, Calif.
Midwest Factory — 4856 S. Halsted Street, Chicago, Ill.

Service Representatives and Warehouse Stocks in All Principal Cities.

TURCO PRODUCTS, INC.,
6135 South Central Avenue, Los Angeles 1-73

Please send free literature describing the new TURCO REDI-PAINT.

NAME_____ TITLE_____

FIRM_____

ADDRESS_____

STYLE 11.

KENNAMETAL* Helps To Meet *Specifications* IN DELIVERY, TOLERANCE, AND FINISH

• Because of the exacting specifications that must be met by industry in the manufacture of machined steel parts, KENNAMETAL has been installed in steel-cutting operations throughout the world. The reason for this is performance—performance in meeting requirements of delivery, tolerances, and finish.

KENNAMETAL'S hardness permits the use of greater feeds and requires less frequent regrinds. KENNAMETAL'S wear resistance often eliminates the necessity of a finish cut by machining to close tolerances on the first cut. KENNAMETAL reduces loss of size on long cuts to a minimum.

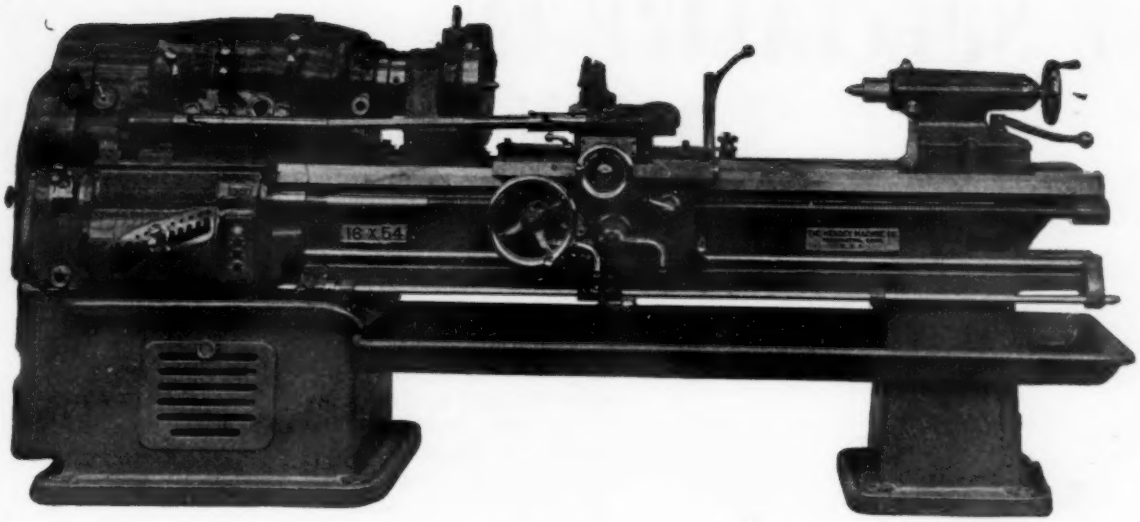
These tools produce a smooth finish because the intermetallic compound made up of fine particles of tungsten-titanium carbide permits high cutting speeds even on hard steel parts.

Simplify the fulfillment of high specifications by putting KENNAMETAL steel-cutting carbide tools in your tool posts.

KENNAMETAL THE All America CARBIDE

* INVENTED AND MANUFACTURED IN U.S.A.

McKENNA METALS Co.
103 LLOYD AVE., LATROBE, PA.



HENDEY

The Hendey lathe as illustrated is equipped with sub-headstock and relieving attachment. The sub-headstock is a speed reducing unit giving one turn of driving plate to six revolutions of spindle.

With these two attachments the lathe is prepared to

Chase screw threads having very long leads;
Turn and relieve wide forming cutters;
Turn and relieve hobs with long leads;
Relieve milling cutters with large numbers of teeth;
Turn work on dead centers.

And it is still a 100 percent Precision-Production lathe capable of taking care of every variety of work which may be done in an engine lathe.

THE HENDEY MACHINE COMPANY, TORRINGTON, CONN.

BOSTON NEW YORK ROCHESTER DETROIT CHICAGO

WE SPECIALIZE IN LAMINATED METALS

THE corrosion resisting — oxidation resisting properties and electrical characteristics of the precious metals have made them a "must" in many parts of the nation's war machine.

Fortunately, strength, rigidity and other necessary qualities, which they lack, can be supplied by our perfected process of lamination with base metals. This provides precious metal on the exposed surfaces, where it is needed, and a base metal alloy body to meet conditions of service.

Laminated metals have been our specialty since our Company was founded, more than half a century ago, and we naturally excel in this field. We can supply you with laminated metals in sheet, wire, tubing or manufactured parts to your specifications and blueprints.

D. E. Makepeace Company
Attleboro, Mass.

"SUPER-KOOL" "81X"

ThredKut "99"

Stuart Grinding Oils

"Excelene"

. . . for Top Efficiency in Thread Grinding

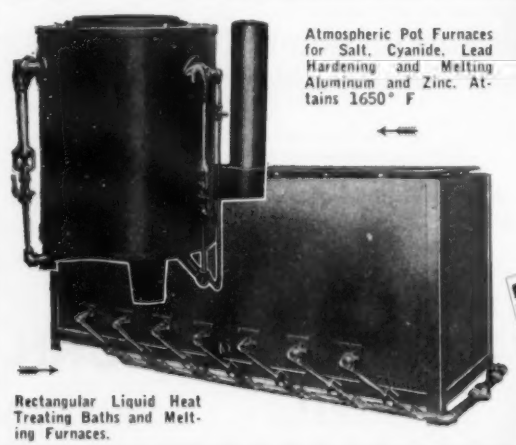
STUART Thread Grinding Oils are in wide use, giving unequalled efficiency at nominal cost. Developed in co-operation with leading manufacturers of thread grinding machines and wheels, they have been proved in many of the largest and most modern metal working plants . . . A Stuart Oil Engineer will gladly help you achieve top efficiency in thread grinding. Ask him to come in.

For All Cutting Fluid Problems

D. A. STUART OIL CO.

Chicago, U.S.A. • LIMITED • Est. 1865

Warehouses in Principal Metal Working Centers



Atmospheric Pot Furnaces for Salt, Cyanide, Lead Hardening and Melting Aluminum and Zinc. Attains 1650° F

Rectangular Liquid Heat Treating Baths and Melting Furnaces.

BUZZER Gas Fired FURNACES

Reg. U.S. Pat. Off.

Heat Quickly to High Temperatures, without Blower, Power or other Auxiliary Equipment . . . just connect to your Gas Supply.

All "BUZZER" Industrial Gas Furnaces are rugged in construction, efficient in design, economical in operation and fully insulated.

The New BUZZER Catalog gives full details and information on wide range of models and sizes available for Heat Treating purposes, Burners and other equipment. Send for it today.

CHARLES A. HONES, INC.
121 South Grand Avenue, Baldwin, L. I., N. Y.

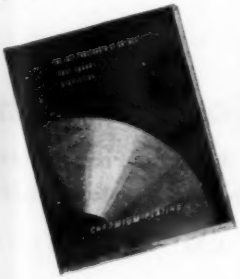
IS CHROMIUM PLATING YOUR ANSWER TO EXTENDING THE LIFE OF VALUABLE TOOLS AND EQUIPMENT?

CHROMIUM PLATING overcomes replacement problems of many parts subject to corrosion and abrasion

DO PARTS of your vital equipment come in contact with corrosive or abrasive materials? Do you want to keep these parts on the job longer . . . and reclaim them when worn? These advantages—made possible in countless cases by chromium plating—may be the answer to your problem.

For example, the extreme hardness and low coefficient of friction of chromium greatly reduce packing wear and virtually eliminates scoring of truck and tractor pump shafts. Chromium plated piston rods on hydraulic pumps outlast unplated pistons four or five times, eliminate rust and reduce frictional resistance.

On the rotors and cases of plastic mixing machinery, chromium resists attack by the corrosive compounds. Roll and roller bearing parts show no signs of wear after years of severe outdoor service. In addition, these and hundreds of other parts can be put back into service when worn simply by building them up with chromium in a fraction of the time required for new parts.



Booklet describes these applications in detail

"The Last Thousandth of an Inch" will assist in determining the applications for chromium plating on your own parts and equipment. In writing for a copy, please mention American Machinist.

FOR MANY OTHER EQUIPMENT PARTS

These are just a few of many ways that chromium plating saves valuable materials and man-hours for war production—by reclaiming hard-to-replace machine tools and equipment parts that have been worn or machined off-size and would otherwise have to be scrapped. Successful applications for both new equipment and salvage include:—taps, reamers, broaches and burnishing bars, jigs and fixtures, dies and mandrels, plug and ring gauges as well as many types of shafts, axles, cylinders, pistons and rings.

UNITED CHROMIUM
INCORPORATED

51 East 42nd Street, New York, N. Y.

Waterbury, Conn. ☆ **Detroit, Mich.**

SHELLS FOR EVERY FRONT

CLEANED *Thoroughly Quickly* IN DETREX DEGREASERS

All glory to our fighting men. We are proud of them.

It is a source of satisfaction to us at Detrex to know that our processes are helping in the war effort.

Speed, vital to our War Supply and Armament Production, is graphically illustrated by advancements in industrial cleaning methods over World War I. Work that took half an hour or more to clean in those days is now Detrex Degreased in a minute . . . and the cleaning is more thorough, too! Imagine the saving in production time and cost.

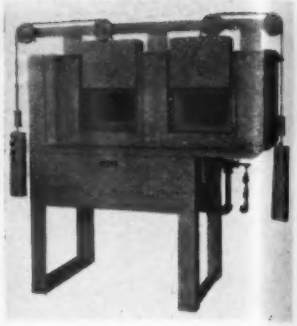
Projectiles, Radar, Aircraft, Mobile Equipment, Guns and Control Apparatus—to mention a few of the many Detrex war production cleaning applications—are all Victory bound. Detrex equipment is "In the Service", even up to the front where it is used in repair and maintenance cleaning.

SOLVENT DEGREASING and ALKALI CLEANING

DETROIT REX PRODUCTS COMPANY

13023 MILLERVIEW AVENUE • DETROIT, MICHIGAN

VULCAN Double Chamber High-Speed H.T. FURNACE



Designed to assure fast, economical heat treating of carbon and high-speed steels requiring temperatures ranging from 800° F. to 2350° F. May be oil or gas fired, and furnished with muffles and prepared atmosphere. Temperature of high heat chamber at left is automatically controlled. Temperature of pre-heat chamber at right is controlled by sliding damper over by-pass between the two chambers—a definite improvement over old style two-story furnace in which the temperature of pre-heat chamber could not be controlled.

VULCAN furnaces of this type can be supplied in standard sizes from 13" x 13" to 18" x 36" hearth area.

For further details, write for Bulletin 935. For furnaces of other types, send for Bulletin "V".

VULCAN CORPORATION
1737 CHERRY STREET, PHILADELPHIA, PA.

ALLOY S.A.E. HY-TEN N.E. STEELS

We solicit your inquiries

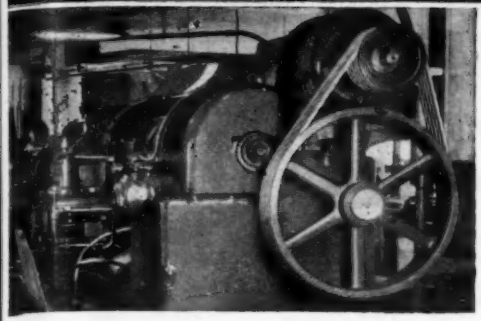
Even though warehouse stocks today are not as plentiful as you and we would like there are still a substantial number of sizes in a variety of analyses available for immediate shipment. We will do everything within our power to help you make the guns and tools and ships and planes and tanks which will win the war.

Wheelock, Lovejoy & Co., Inc.

Main Offices: 137 Sidney St., Cambridge, Mass.

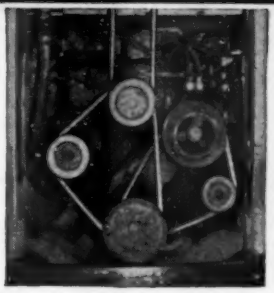
Cleveland, Chicago, Newark, Detroit, Buffalo, Cincinnati

In Use for Years by Leaders of U. S. Industry



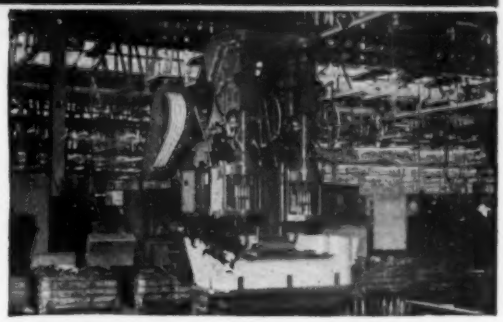
In a
Leading Machine-Parts Plant—

belts on screw machines and grinders are subjected to a severe oil condition. GATES special synthetic belts were adopted 100% for this severe service after months of testing proved that they last three times as long as any rubber belt ever used.



A Large User of
Rear Engine Coaches

could get only 13,000 to 14,000 miles from natural rubber belts in rear engine coach and bus service where rapid and frequent acceleration and deceleration create high temperatures. GATES special synthetic belts are giving double the life in this demanding service.



This
Outstanding Aircraft Factory

—one of the nation's leaders—has found that Gates special synthetic belts last three to four times as long as regular rubber belts on machines where the belts are badly exposed to oil.

GATES
Heat and *Oil* V-BELTS
of *Special* Synthetic Rubber

Are Giving Up to 230% Longer Life than natural rubber belts when subjected to heat and oil . . . Initial cost at present is higher . . . recommended to meet especially severe oil and heat conditions.

Gates has been building V-belts with synthetic rubber for many years. Thousands upon thousands of Gates V-belts without an ounce of natural rubber in them have now seen years of service in many of the nation's leading industrial plants.

From this long experience with synthetic rubbers, Gates engineers have developed a V-belt built of a special synthetic which withstands severe heat and oil conditions that natural rubber simply cannot stand. The initial cost of these special belts is at present higher than Gates Standard Vulco Ropes. That is why the Gates Field Engineer you consult now recommends this special heat and oil belt only if its higher cost will be more than offset by longer service life.

There are many commercial types of synthetic rubbers. Gates has had wide experience in the use of all of them.

You have doubtless seen recent press dispatches stating that all V-belts will shortly be made of synthetic rubber. Gates long experience and success in this field clearly represent a substantial advantage in giving you a synthetic rubber V-belt of truly superior quality.

THE GATES RUBBER COMPANY

437

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

CHICAGO, ILL. 549 West Washington
NEW YORK CITY 215-219 Fourth Avenue
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DENVER, COLO. 999 South Broadway
DALLAS, TEXAS 2213 Griffin Street
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METAL CLEANING EQUIPMENT

COMPLETELY AUTOMATIC

Conveyorize your metal cleaning operations! Barry-Wehmiller Metal Cleaning Equipment will handle a wide variety of metal parts without labor for loading or unloading. Illustrated is one of a number of units cleaning 20 mm. shell.

Completely Automatic • One Push-Button Control
Spray or Submerged Types
Solvent or Alkali Type Cleaning

BARRY-WEHMILLER MACHINERY CO.
ESTABLISHED 1885
4660 W. FLORISSANT AVE. ST. LOUIS, MO.

Is this YOUR Cleaning Problem?

DEGREASING ALUMINUM PARTS BEFORE ANODIZING

Cowling, struts, propellers, pistons . . . in fact, all aluminum and aluminum alloy aircraft parts that are to be anodized . . . should be THOROUGHLY clean. Grease, oil and other deposits must be COMPLETELY removed if the most effective anodized coating is to be obtained.

One way to be sure you get these results is to use Oakite Aviation Cleaner. Here is a specially designed, free-rinsing material that gets rid of ALL foreign matter QUICKLY . . . and does it without pitting, etching or discoloring aluminum surfaces. Write today for complete details.

OAKITE PRODUCTS, INC., 24 Thames St., NEW YORK
Technical Service Representatives Conveniently Located in All Principal Cities of the United States and Canada

OAKITE Buy Bonds for Victory **CLEANING**

ALADDIN ROD ALADDIN ROD
Patent No. 2055360 NO FLUX NO ACIDS

DOES IT QUICKER, BETTER, MORE ECONOMICALLY
WELDS ZINC BASE DIE CAST and BRAZES ALUMINUM

Repairs KIRKSITE and other zinc base dies, with die in either horizontal or perpendicular position. Unexcelled for use on sheet or cast aluminum, saves time and heat. Complete instructions with each pound. Sizes 1/16", ⅛", 3/16" & ¼" also complete assorted lb. WRITE FOR FREE LITERATURE.

ALADDIN ROD & FLUX MFG. CO.
Box 935 Mad. Sq. Sta., Dept. G Grand Rapids, Mich.

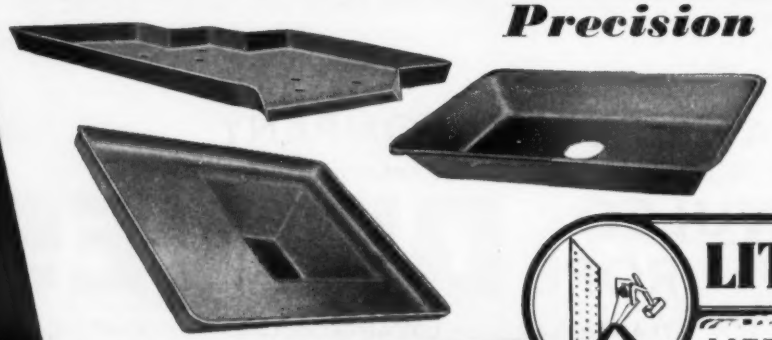
In the May 27th issue of American Machinist the Ozalid whiteprint in the Ozalid Products Division's advertisement was represented as having orange lines on a white background. This was a printing error. Ozalid whiteprints have blue, black or maroon lines on a white background.

"One of the World's Largest Builders of Electric Arc Welders"

HOBART Simplified ARC WELDERS

THE HOBART BROTHERS COMPANY, BOX 78 TROY, OHIO *Write for Catalog!*

Precision LATHE PANS



If your Lathe or another piece of equipment needs a pan, Littleford can fabricate it to specifications. Any size or shape can be made in our modern plant. Send blueprints for prices.

LITTLEFORD

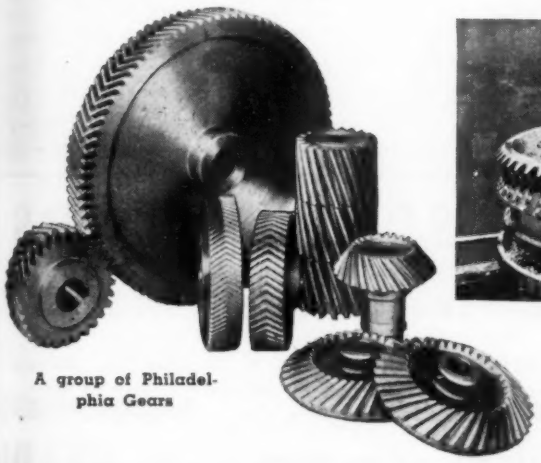
LITTLEFORD BROS., INC.
434 E. Pearl St., Cincinnati, Ohio

We've had our second front from the start

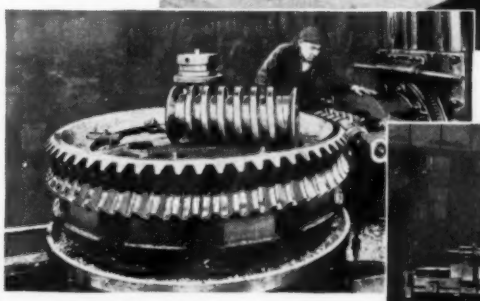
We've been producing gears for the fighting front, with vast numbers going directly into war equipment . . . and also for the production front, where they are needed in the plants turning out the guns and tanks, ships and planes. For either of these fronts, Philadelphia Gears are of the essential high quality and accuracy. Our 51 years of gear making is behind this statement. Remember, Philadelphia gears are produced in all types, sizes and available materials.

Can we help you meet your present essential needs or aid your future product planning?

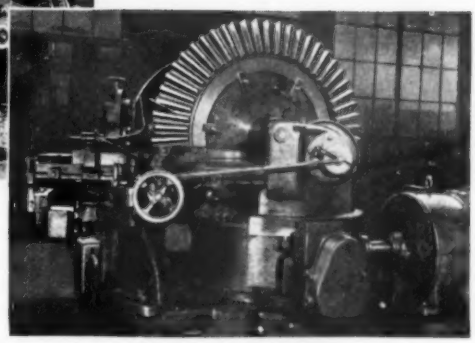
Write for our Gear Catalog.



A group of Philadelphia Gears



Generating a Philadelphia Worm Gear



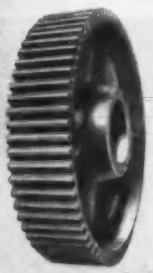
Form-planning a Bevel Gear

PHILADELPHIA GEAR WORKS

INDUSTRIAL GEARS
AND SPEED REDUCERS
LIMITORQUE VALVE CONTROLS

ERIE AVENUE & G STREET
PHILADELPHIA, PA.
New York, Pittsburgh, Chicago

Philadelphia
LIMITORQUE CONTROL
operates all types of valves, etc., safely, economically, from convenient stations.



Philadelphia
GEARS
All types and sizes of industrial gears. Can be supplied in all materials.

Philadelphia
HERRINGBONE SPEED REDUCER
for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.

Philadelphia MOTOREDUCER
The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.

Philadelphia
WORM GEAR SPEED REDUCER
right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

THE JOHNSON FRICTION CLUTCH

FLOATING DISC CONSTRUCTION MINIMIZES DRAG, ABRASION AND HEATING in the

"MAXITORQ" MULTI-DISC CLUTCH

DOUBLE

Construction of the "MAXITORQ" is such that when in neutral, no disc touches the ones adjacent to it. A separator spring between each pair of inner discs spreads these endwise with an accordion action, so that light can be seen between all discs.

Floating disc construction is but one of several new and exclusive improvements developed by Johnson in "MAXITORQ" multiple disc design. Other features include manual assembly without the use of tools and quick and simple manual adjustment.

SINGLE

"MAXITORQ" CLUTCHES are ideal for machine tool and many other industrial applications. They are available in wet or dry unit single, double or cut-off coupling types in capacities from ½ to 5 hp. at 100 R.P.M.

Write for detailed data sheets covering "MAXITORQ" CLUTCHES

Write for Multi-Disc Clutch Catalog No. 72 or Consult "Sweet's" or "Thomas Reg."

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

2 TONS of accurate gear

STAHL GEARS

This large gear weighing approximately two tons meshes with a split pinion weighing 1050 pounds. Stahl produced both.

Why not have Stahl estimate on your gear requirements—regardless of size or quantity.

THE STAHL GEAR & MACHINE CO.
CLEVELAND OHIO

QUALITY GEARS CUT TO ORDER

• MEISEL produces but one *kind* of gears . . . gears constructed for specific jobs. Only through the inherent accuracy of this special designing could such dependability, performance and economy be possible. Tell us what you expect it to do, and we'll show you the *one* gear suited for your job.

MEISEL PRESS MFG. CO.
946 Dorchester Avenue Boston, Mass.

GANSCHOW GEARS

FOR SIXTY YEARS

Spur – SPEED REDUCERS – Worm

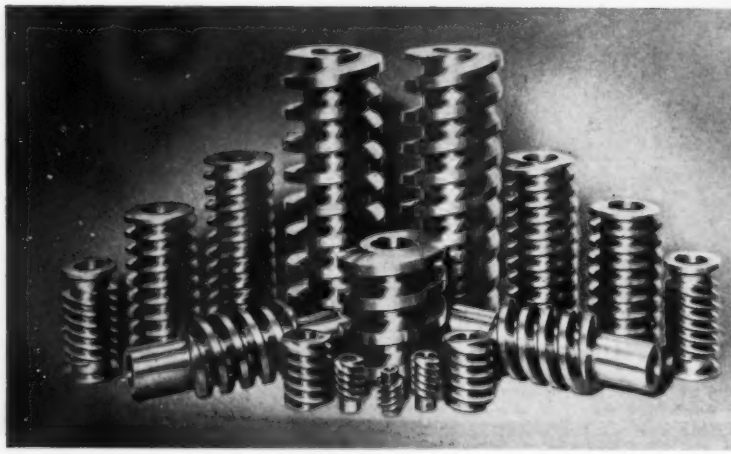
ALL TYPES OF CUT GEARS

GANSCHOW GEAR CO., 18 N. Morgan St., Chicago

BRAWNY GEARS

PROMPT ECONOMICAL SERVICE
ALL TYPES, MATERIALS AND QUANTITIES
Ask for Estimate

BRAUN GEAR CO., 1590-1608 Atlantic Ave., Brooklyn, N.Y.



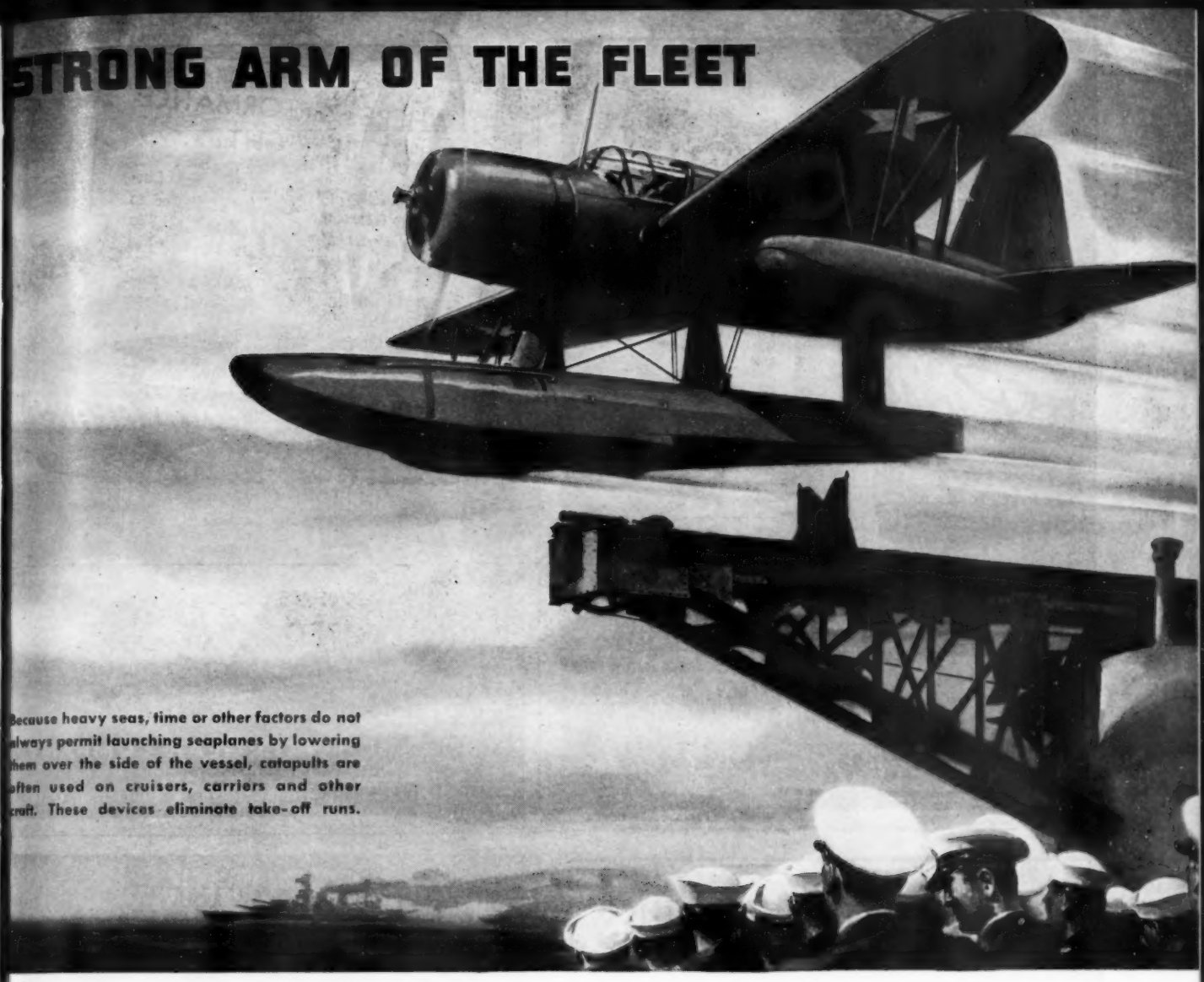
ADAMS GEARS

SPUR — HELICAL — WORM
BEVEL — MITER — RACKS

Splined Shafts A Specialty

THE ADAMS COMPANY
Est. 1883
1942 Bridge St. Dubuque, Iowa

STRONG ARM OF THE FLEET



Because heavy seas, time or other factors do not always permit launching seaplanes by lowering them over the side of the vessel, catapults are often used on cruisers, carriers and other craft. These devices eliminate take-off runs.

TO THROW an airplane into the air takes a mighty strong arm. Launching these eyes of the fleet from a cruiser deck is the job of the catapult.

Gears on the catapult must be rugged to stand the punishing shock that comes when the speed of the airplane weighing more than two tons is increased from 0 to 70 miles per hour in a distance of 60 feet!

The gears in the engines powering these planes must be tough, too. For though light in weight, their job is to transmit the power of 2000 horses to whirling propeller blades.

Making these gears—the rugged ones for the launching devices and the marvels of high precision for the airplane engines—is Foote Bros.' job, and Foote Bros. are proud of the service that the gears they make are rendering—proud of the manufacturing know-hows, the advancements in techniques that have been developed to produce these gears in the tremendous quantities needed for an America at war.

But more important to American Industry is what these manufacturing know-hows will mean to peacetime production. For experience gained today in producing gears that are tougher—gears that possess a higher degree of precision—gears that demand the latest manufacturing technique will assure more economical power transmission—more efficient machines for American Industry when the war is won.

FOOTE BROS. GEAR AND MACHINE CORPORATION
5225 South Western Boulevard • Chicago, Illinois

ARMY E NAVY

FOOTE BROS.

Better Power Transmission Through Better Gears

SUPPLIED IN ANY DESIRED MATERIAL

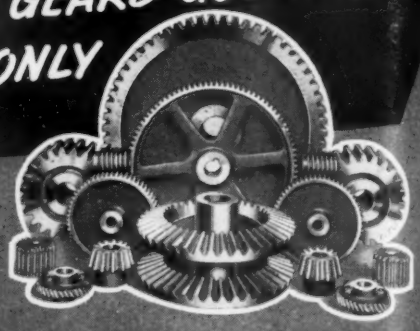
DETROIT BEVEL GEAR COMPANY
8130 JOS. CAMPAU AVE.
DETROIT, MICH.
Makers of Quality Gears for 30 Years

WHERE PERFORMANCE MUST BE RIGHT . . .

The outstanding performance of Cincinnati Gears may well be attributed to our experience, knowledge and skill in producing the right gears for the job.

Where performance must be right you'll usually find Cincinnati Gears giving longer gear life and greater production.

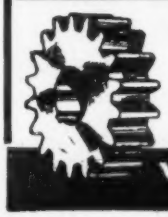
GEARS-GOOD GEARS ONLY



THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Mariemont Ave. • Cincinnati, Ohio

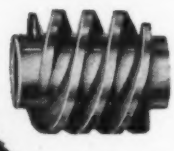
GEAR CUTTING MACHINES
New Design
New Features
New Advantages
NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK, NEW JERSEY

ACROMARK
numbering, stamping and marking machines and accessories are extensively used where fast, accurate permanent work is a prerequisite.
THE ACROMARK CO. ELIZABETH NEW JERSEY



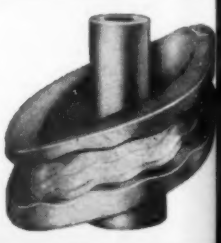
GEARED FOR VICTORY
Bevel-Spur-Worm-Helical
THE TAYLOR MACHINE COMPANY
1917 East 61st St. Cleveland, Ohio
"TAYLOR-MADE"

"HARTFORD" for Gears, Cams, Thread-Grinding



OUR SERVICE INCLUDES:
- . . . cutting gears of every description exactly to specifications
- . . . grinding gears, cams and threads
- . . . furnishing aeronautical parts on a contract basis

You plan and we execute—assuring speedy production, prompt delivery and reasonable price. Send blue prints or samples for estimate.



THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.

SIER-BATH *Precision* GEARS

. . . produced on modern machines by experienced craftsmen in a

NEW MODERN PLANT

Fred—our Gleason specialist in the modern Sier-Bath plant — has been cutting bevel gears for many years. His long experience has contributed to Sier-Bath's well earned reputation for producing high quality precision gears.

In every department at Sier-Bath, a visitor is impressed with the complete, modern facilities for producing all types of precision gears. Special machines in the hands of men who "know their gears" together with constant checking and inspection through every phase of production contribute to Sier-Bath's fine record as a producer of precision gears over a period of thirty-eight years.

Expanded facilities now enable Sier-Bath to assure prompt deliveries on gears from 2" to 52" diameter on high priority orders. Send us your specifications.

The Doorway to 38 years experience in making Precision Gears

SIER-BATH GEAR CO.
NORTH BERGEN NEW JERSEY
Incorporated

Gear Specialties

SPURS • HELICALS • BEVELS
(Straight & Spiral)
WORM GEARING • THREAD GRINDING
(14 to 96 D. P.)

This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

With full *production capacity* scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every *urgent* need will be given careful consideration.

Gear Specialties
MANUFACTURERS
CHICAGO

2600 W. Medill Av. Ph. Hum. 3482

GRANT GEARS

"64 YEARS" MANUFACTURING GEARS

Despite the continued growth of our gear business we are still in position to give each customer the attention they have a right to expect.

We carry a complete stock of standard cut gears and can furnish special gears to your specifications.

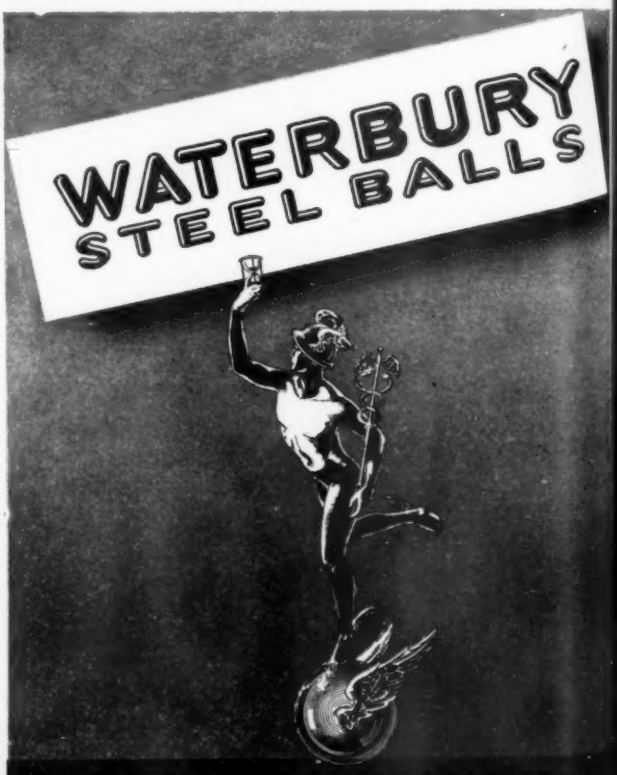
GRANT GEAR WORKS
BOSTON, MASS.
ESTABLISHED 1877 BY GEO. B. GRANT

Get all the benefits of new electrified equipment with MASTERDRIVE

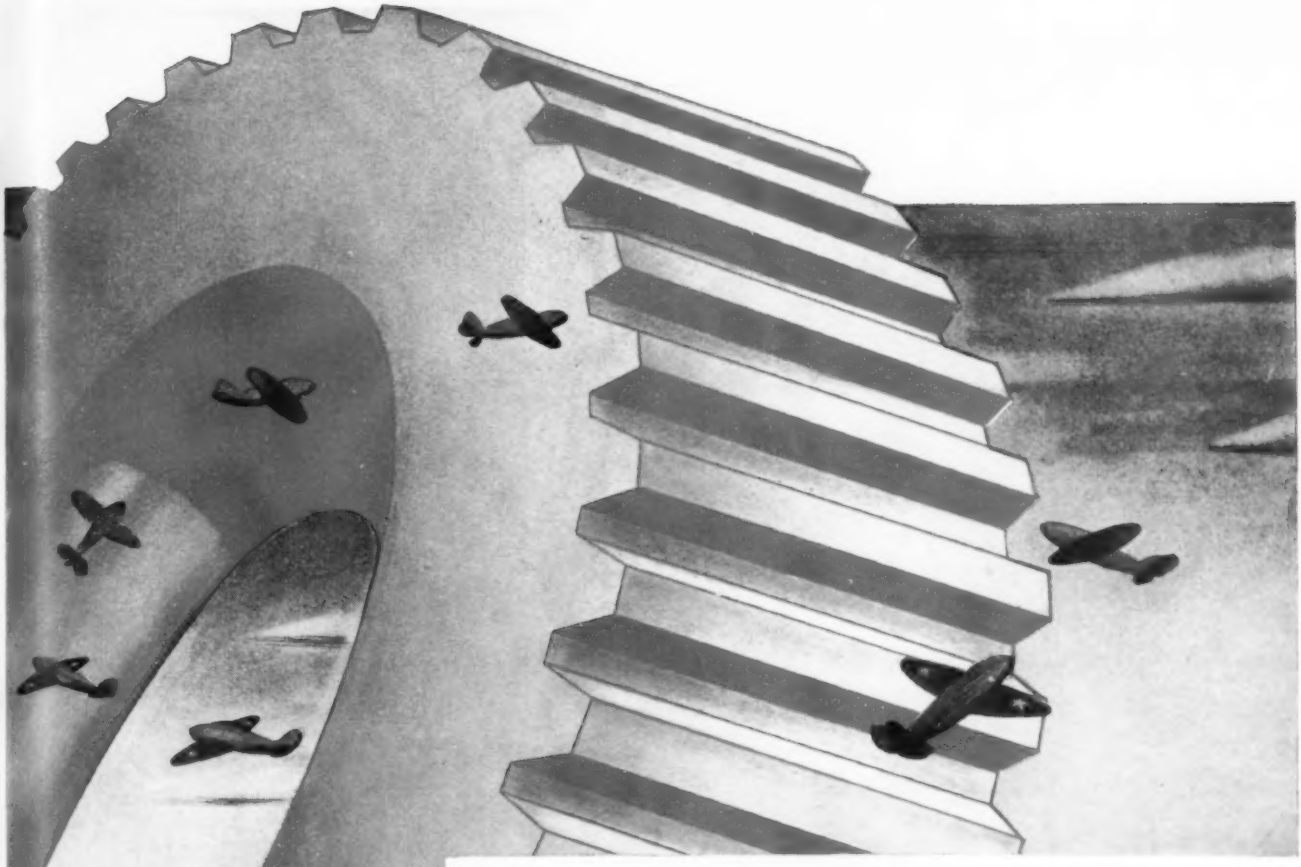
1. Increase tool efficiency at low cost.
2. Eliminate lineshaft hazards.
3. Permit flexibility of plant layout.

Masterdrives are available to 750 tool drive specifications, including grinder drives suitable for Heald, Norton, Cincinnati, Rivett and many other machines. Simple to attach, operate and maintain, yet they offer the advantages of new electrified equipment at used machinery cost. A single complete installation with Master Gear Head Motor — one responsibility. Write today!

THE MASTER ELECTRIC COMPANY
INDUSTRIAL EQUIPMENT DIV. – DAYTON, O.



THE WATERBURY STEEL BALL CO. INC.
U. S. A.
MAIN OFFICE: POUGHKEEPSIE, N. Y.



—on the proving ground of War!

War is grim and tragic. A tremendous price is being paid for the mistakes of the past—and for the blessings of the future. Yet, this is certain: Paved with blood, sweat and tears, the proving ground of war is cruelly efficient. Under the merciless lash of Mars, necessity has inspired science and industry to new heights of achievement. For example, here at Perkins the extraordinary developments in the mass production of precision, custom-cut gears give but a hint of the golden age of progress just beyond the horizon. After Victory is won every product which depends upon gears for the transmission of power, will be better and more efficient. The experience this Company has gained in the production of precision gears to Government specifications will help to bring new and better standards of living to America and to all the world.

PERKINS MAKES:

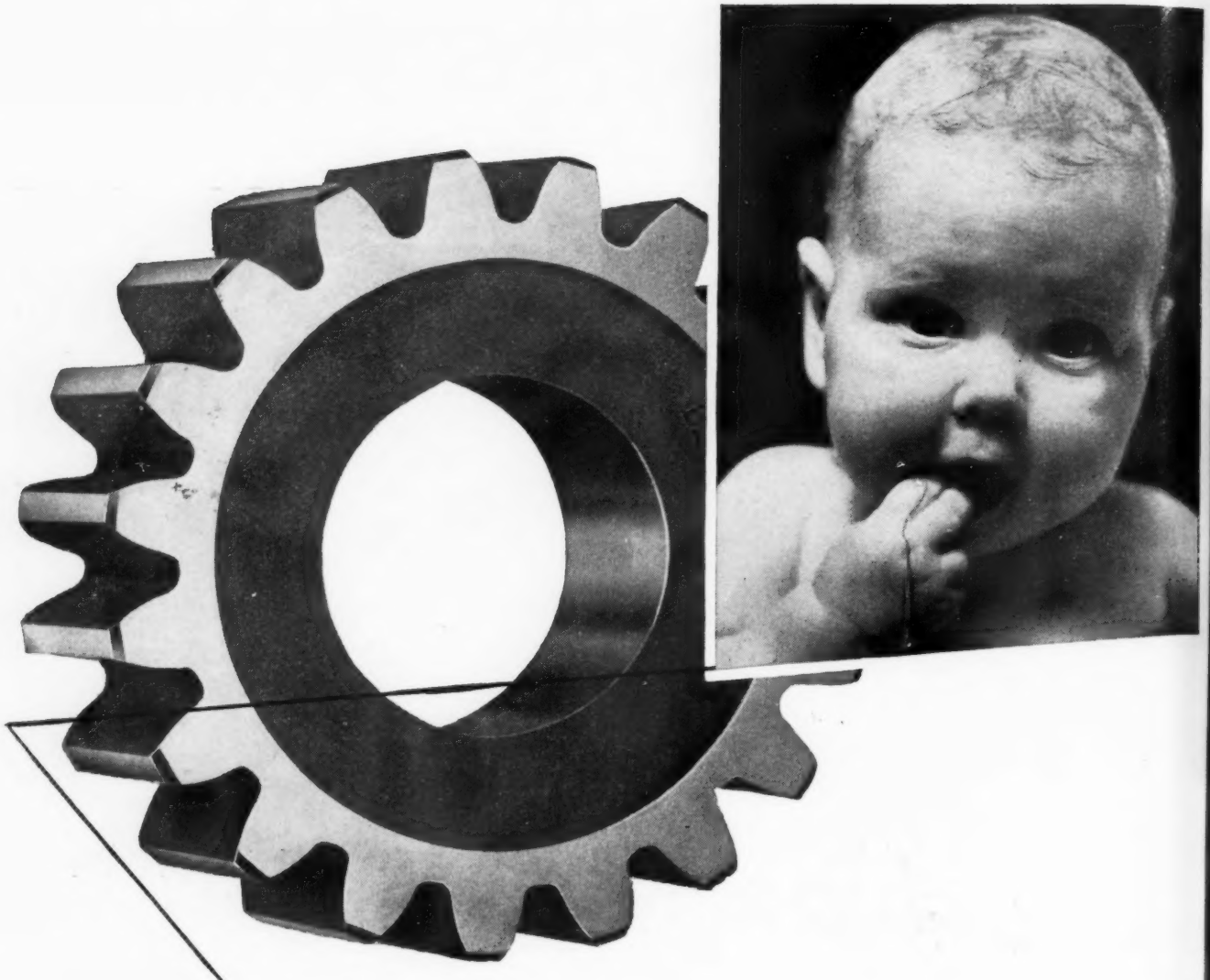
Helical Gears	*Bevel Gears*	*Ratchets*
Worm Gears	*Spiral Gears*	*Spur Gears*

Ground Thread Worms

PERKINS PRECISION, CUSTOM-CUT GEARS

help power American Planes, Tanks and Guns

PERKINS MACHINE & GEAR COMPANY, SPRINGFIELD, MASS.



WHEN IT COMES TO CUTTING TEETH...

Cutting teeth . . . properly . . . is an important job. And where *gears* are concerned—that's where we come in!

Even the smallest gear is a mighty important part of the nation's industrial war machine. It is vital, therefore, that each and every tooth be uniform. Hence, gear grinding today must combine ultra high precision with unquestioned dependability.

As manufacturers and manufacturers' representatives of super precision machine tools and instruments, COSA Specialists are in a position to show you how you can attain consistent accuracy and highest efficiency in your tooling operations, AND, at the same time, reduce cost, time and labor.

COSA CORPORATION is sole distributor for SIP (Société Genevoise) Machines; Maag Gear Grinding Machines; Mikron Machines; and numerous other precision machines imported from Switzerland. If your tooling problem is one that can be solved by high precision methods, discuss it with one of our engineers. His broad experience may hold the answer. Write to the Cosa Corporation, 5000 Chrysler Building, New York 17, N. Y.

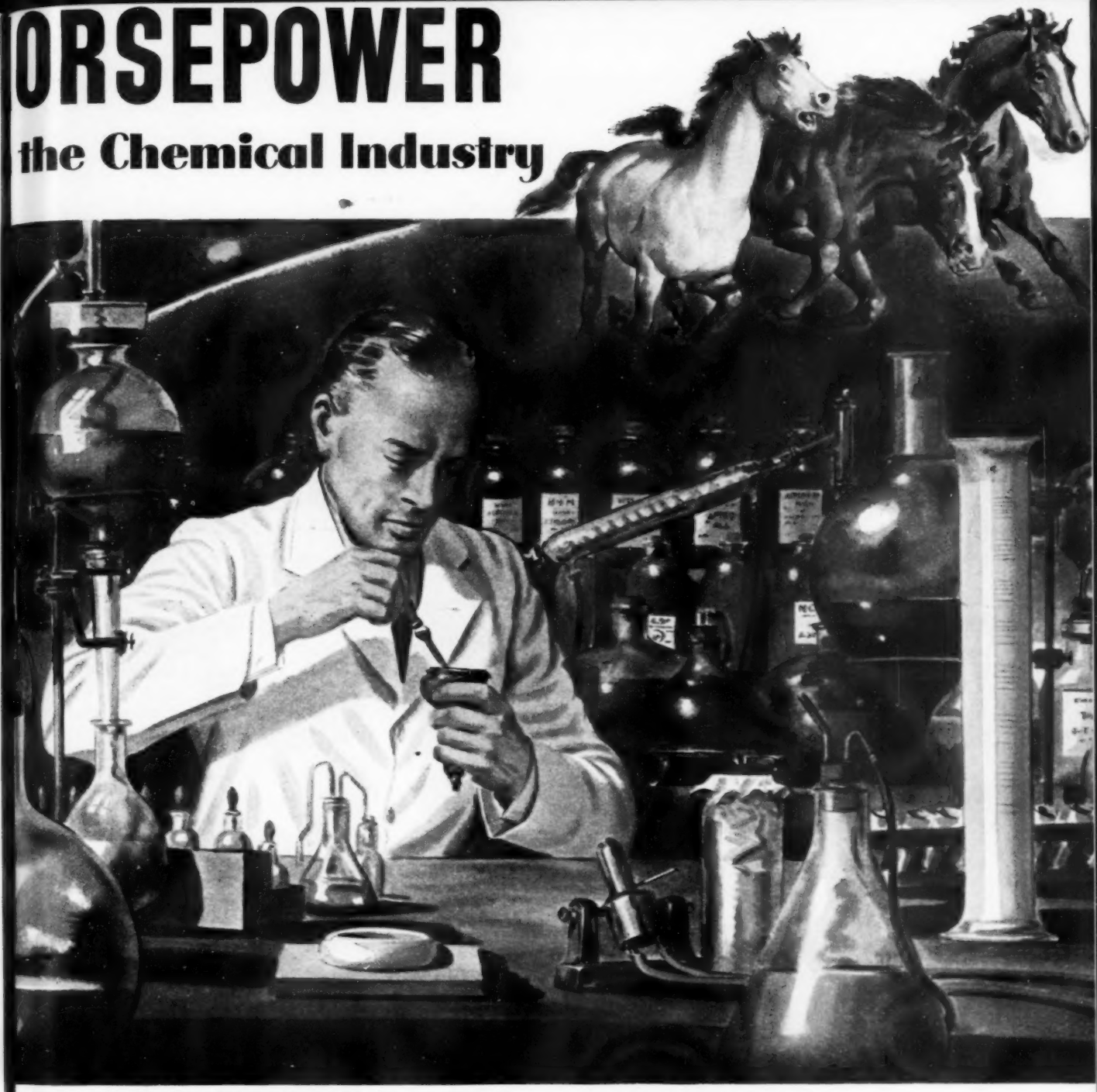
COSA CORPORATION

SWISS-AMERICAN GEAR CORP.

ENGINEERS · MANUFACTURERS · IMPORTERS · EXPORTERS

ORSEPOWER

the Chemical Industry



More than 200,000 products entirely new to man have come from chemical laboratories since 1914. The amazing growth of America's great chemical industry is an outstanding example of what is possible under the free enterprise system. In the chemical field, as in all other great American industries, trouble-free, dependable Howell Motors are used extensively.

Magnesium from sea water! Colors from coal tar! Synthetic rubber from petroleum! Nylon from coal! These are among the innumerable achievements of chemistry.

Few people realize the amount of electrical horsepower utilized and the importance of horsepower in this vast industry.

Howell Electric Motors have long been a favorite in the chemical industry, where the failure of a motor at a critical time might mean the loss of thousands of dollars.

This can mean but one thing: Howell Motors have what it takes to do the job better — more economically!

Now, that the War Production Board regulations require that you specify the simplest, lowest horsepower motor that will meet your requirements, it is to your present and future interests to insist on Howell — the precision-built motor.

Howell is the one motor you can "load" with full confidence in its ability to stand up under the toughest jobs within the limits of safety.

The **HOWELL IDEA**
in Electric Motors
precision-built

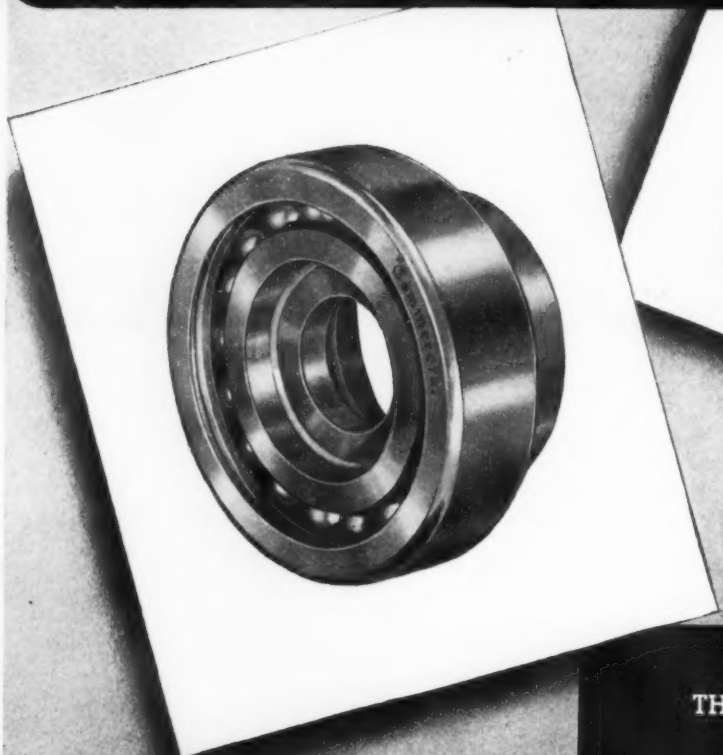
HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICH.

Manufacturers of Quality Motors Since 1915

QUALITY ACCURACY PRECISION

FOR THE DURATION, WE ARE UNABLE TO SUPPLY MANY TYPES OF BEARINGS FORMERLY MANUFACTURED

"Commercial" ANNULAR BALL BEARINGS

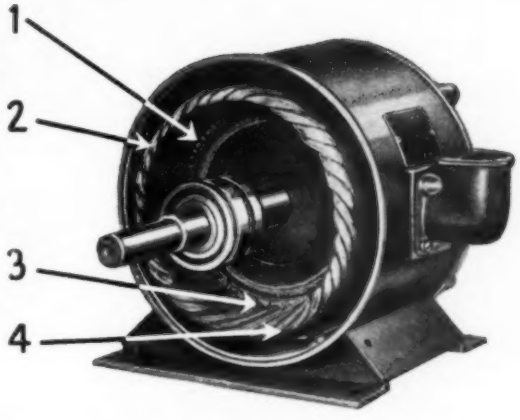


THE SCHATZ MANUFACTURING CO.
U. S. A.
REPRESENTATIVES LOCATED AT
Detroit: 2640 Book Tower • Chicago: 902 S. Wabash Ave.
Cleveland: 402 Swetland Bldg. • Los Angeles: 5410 Wilshire Blvd.

NEW INSULATION DEVELOPMENTS GIVE *Longer Life...*

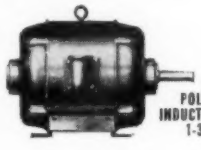
R&M Uni-Shell INTEGRAL HORSEPOWER MOTORS

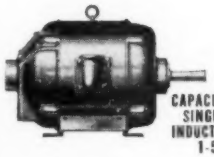
Important improvements in insulating technique, plus heat-testing of each design with thermocouples imbedded in the windings, insure cool operation with sharply increased life expectancy for every R & M Uni-Shell Motor. Four features of this insulation are indicated in the accompanying illustration. 1. Two layers of the highest-grade impregnated rag paper. 2. Wire coated with double-weight synthetic resin for greater insulating strength. 3. An *extra* sheet of impregnated paper placed between coils in slot, and a new method for holding and insulating end coils. 4. Entire winding assembly given several baked coats of synthetic resin-base varnish and covered with moisture-resistant synthetic resin and tung-oil sealer. . . . *By actual test we can say that the Uni-Shell Motor meets all temperature guarantees—inside and out.*

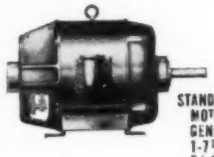


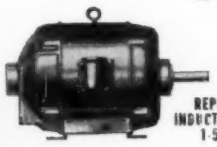
ONLY END HEADS CHANGE

Every dimension, from body to head fit, identical for all motor types.


POLYPHASE INDUCTION MOTOR 1-30 H. P.


CAPACITOR START SINGLE-PHASE INDUCTION MOTOR 1-5 H. P.


STANDARD D. C. MOTOR AND GENERATOR 1-7½ H. P. ¾-5 K. W.


REPULSION INDUCTION MOTOR 1-5 H. P.

ALL MOTOR TYPES INTERCHANGEABLE

All types in any one frame size in the new Uni-Shell motor line are interchangeable and similar in appearance. Every dimension and detail, from Uni-Shell motor body to head fit, is identical—only the end heads change. And in these cylindrical shells of steel are the finest, longest-lived motors that R & M has built in nearly 50 years of motor specialization. Advances in bearing quality and alignment, precision-balanced rotors, better insulation, cooler interior ventilation and many other features contribute to new high standards of efficiency and performance.

Whether you use motors as a part of your product, or only on the machines in your plant, the advantages of interchangeable motor types, together with the new motor efficiency, are easy to see. Write for your copy of our new 20-page illustrated book on R & M Uni-Shell Motors.

Mail Coupon **FOR NEW 20-PAGE UNI-SHELL BOOKLET**

ROBBINS & MYERS, INC., Springfield, Ohio

Gentlemen: Please send me your new 20-page booklet on Uni-Shell Motors.

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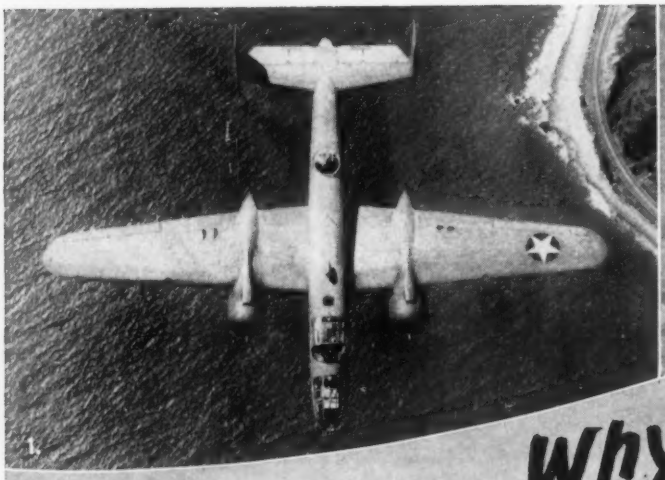
I would ☐ would not ☐ like to talk to a representative. AM4

ROBBINS & MYERS • INC.

MOTOR DIVISION, SPRINGFIELD, OHIO

HOISTS & CRANES • MACHINE DRIVES • FANS • MOYNO PUMPS • FOUNDED 1878



8 Reasons Why We're Gaining VICTORY thru AIRPOWER

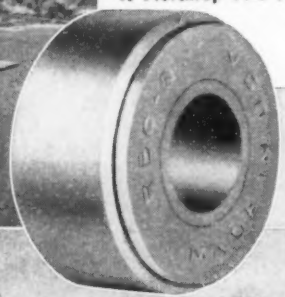
All planes illustrated are equipped with

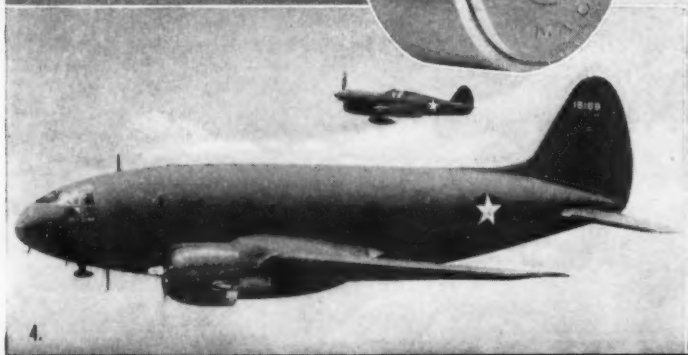
RBC

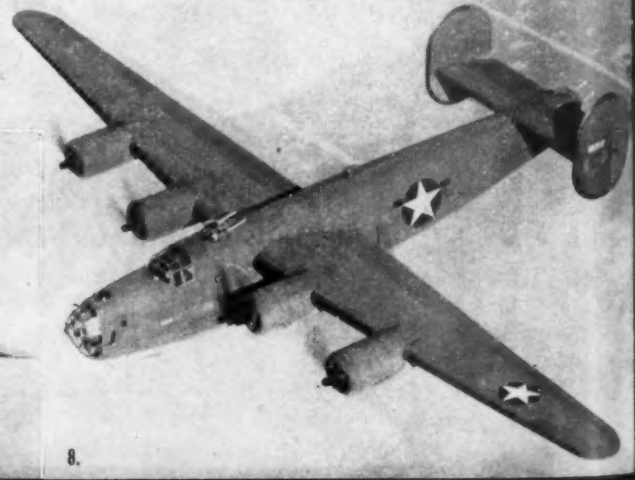
NEEDLE BEARINGS

RBC AIRCRAFT SERIES—#9

1. North American B-25 Mitchell Bomber
2. Grumman F4F Wildcat Fighter
3. Douglas A-20 Boston Bomber
4. Curtiss C-46 Commando Transport
5. Martin 187 Baltimore Bomber
6. Martin B-26 Marauder Bomber
7. Northrop N-3 Patrol Bomber
8. Consolidated B-24 Liberator Bomber







ROLLER BEARING CO. of AMERICA

TRENTON . . . . NEW JERSEY

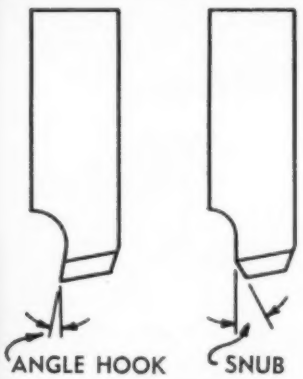
GEOMETRIC

Pointers

FOR SAVING HIGH SPEED STEEL

No. 7

Resharpen Chasers with CORRECT FACE GRIND FOR THE WORK



Use the cutting face grind best suited to the job and you'll (1) lengthen chaser life, (2) get better results. ANGLE HOOK cuts Forged Brass efficiently, but SNUB grind, with stronger cutting edge, is needed for Cast Brass.

To get the most out of your chasers and help conserve precious high-speed steel needed for war production — remember that DIFFERENT MATERIALS REQUIRE DIFFERENT FACE GRINDS. Be sure you are using chasers with the correct face grind for the particular job at hand. For example:

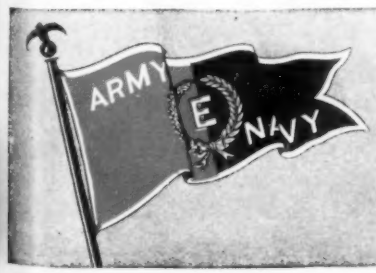
★ Cast Brass requires snub or negative rake
★ Forged Brass requires same angle hook as for steel
Copper requires radial hook or radial lip hook
Cast Bronze requires straight grind

★ See illustration

For free cutting steels a slight angle hook is required. For tougher alloy steels, stainless steels, steel forgings, stampings, etc., the hook must be increased according to the analysis of the material. On the other hand, the hook may be decreased to even a straight grind or snub on nonferrous materials or cast iron.

If in doubt, consult the manufacturer of your chasers. He will be glad to furnish a grinding chart to help you ascertain the correct face grind for each type of work. The Geometric Tool Company, New Haven, Connecticut.

The Geometric Tool Company is listed on the Treasury Department's Roll of Honor of those companies whose employees contribute at least 10% of their savings, through the Payroll Savings Plan, for War Bonds. Buy War Bonds and Stamps each payday. We've done our bit—now let's do our best!



GEOMETRIC

SELF-OPENING DIE HEADS
COLLAPSING TAPS
CHASER GRINDING MACHINES
SOLID ADJUSTABLE DIE HEADS
SOLID ADJUSTABLE TAPS
THREADING MACHINES

Friction Fighter

ROLLER BEARINGS CARRY SHOCK LOADS WITH FULL-LENGTH ROLLER CONTACTS

● Friction Fighter Series "DE" roller bearings, illustrated, are self-contained and are properly adjusted at the factory, requiring no further adjustment at installation. Their inherent self-aligning and pre-adjustment features make it unnecessary to resort to the use of undesirable, expensive, or cumbersome self-aligning housings. The "self-contained" feature also permits the bearing to be floated axially in the housing to compensate for shaft expansion.

Loads are distributed over rollers and races providing reserve capacity, effectively absorbing shock loads and vibration. Inherent self-aligning feature of concave rollers, running between convex races, permits unrestricted compensation for shaft deflection or misalignment without disturbing bearing load contact so that high load-carrying capacity of roller bearing is maintained under all operating conditions assuring maximum durability. Friction Fighter bearings are available without mountings in both roller and ball types or as pillow blocks and units of cartridge, flange, take-up, hanger and duplex types. Link-Belt Company, Indianapolis, Chicago, Philadelphia, Atlanta, Dallas, San Francisco, Toronto. Offices, warehouses and distributors in principal cities. 9191-A

LINK-BELT
FRICTION FIGHTER
BEARINGS
Roller and Ball Types

Sav-way announces

the new Gold Seal Spindle

The Spindle that Breathes!

In the Gold Seal Spindle an ingenious modification of the oil intake admits an air-oil mist, through filters, to the body around the shaft. This lubricating mist is constantly drawn through the moving parts, fore and aft, by the pumping action of the exclusive Sav-Way centrifugal labyrinth seals. This flow automatically excludes dirt and coolant from the spindle.

Maximum service life is further assured by holding torsional vibration and unbalance to an absolute minimum. The rigidity essential to smooth running, high accuracy, and satisfactory finish, is achieved by using the finest of selected extra-precision bearings, applied in pre-loaded duplex pairs. The massive housing is engineered to provide automatic compensation for contraction and expansion. All component parts are deep-frozen to eliminate strain and provide accelerated ageing, with the result that precision alignment is permanently maintained.

The Sav-Way Gold Seal Spindle—the spindle that breathes—has already won its laurels in round-the-clock war production. It will do the same kind of efficient, trouble-free job in your plant!

For a Pre-view of the New Gold Seal Spindle, Attach this Coupon to your Letterhead.

SAV-WAY INDUSTRIES
Box 117, Harper Station (13), Detroit, Michigan

Please send detailed description of the Gold Seal Spindle.

Name _____
Firm _____
Address _____
City _____ State _____

Keep an Eye On

Sav-way INDUSTRIES
★ Machine Tool Division ★
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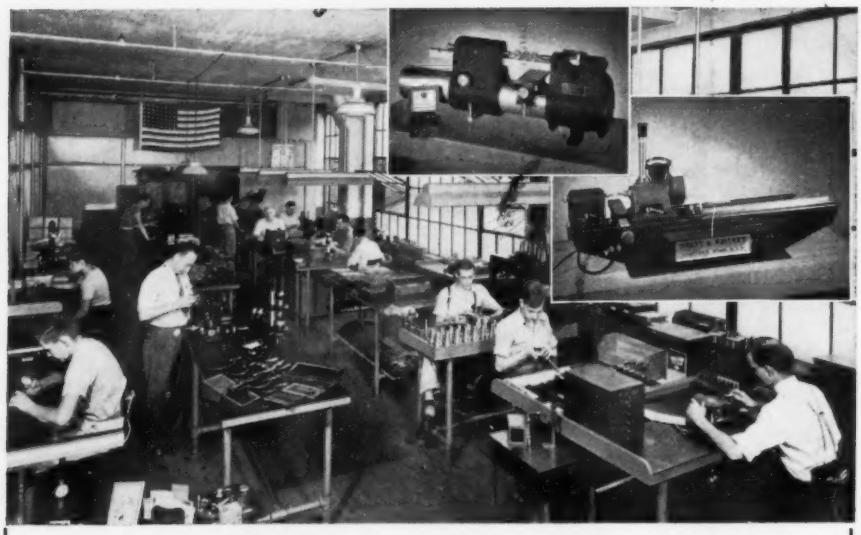

WELDON
Quality Control

A rigidly maintained policy of 100% inspection has gained for WELDON TOOLS an enviable reputation for quality. From three to five inspection operations are performed on each End Mill. The facilities of the Inspection Department include a temperature controlled "Standards Room" equipped with: Optical Tools and Instruments, Pratt & Whitney Measuring Machine and Super-Micrometers and Master Reference Gages.

• • •

Product design and establishment of WELDON TOOL production standards and tolerances are under the control of the Engineering Department. Standard and special tool engineering incorporating a wealth of cutting tool experience represents a service that WELDON is proud to offer.

THE WELDON TOOL CO. *Cleveland, Ohio*

3000 WOODHILL ROAD

How to save time by doing more reading

That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean *both* the editorial and the advertising pages.

Just one new idea gleaned from these pages . . . a method for doing something better or faster or easier or at lower cost, may alone save you far more than a year's reading-hours invested in this and other worthwhile business papers.

Many people have found this a fact . . . not only once, but time and time again. That's significant . . . with time so precious today.

*

Good advertising speeds information from those who have it . . . to those who need it.

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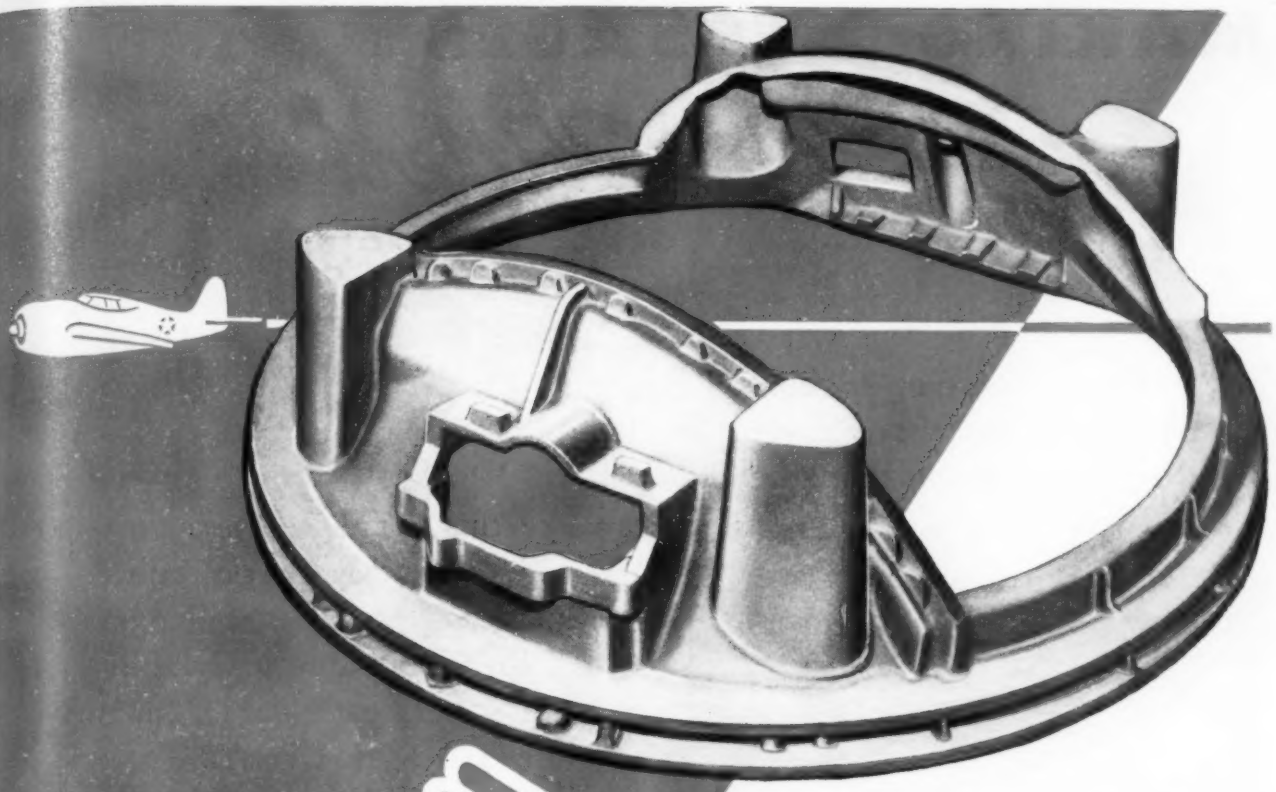

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Giant Aluminum Castings for War Machines

"It can't be done" is never the answer when cast parts, hitherto considered impossible, are brought to Howard Foundry.

Our aluminum division is producing aircraft castings up to seven feet in diameter. Too, we have made aluminum castings up to twelve feet long for other armaments — part of our current output of aluminum cast parts for tanks, ships, planes, and ordnance.

At our magnesium and bronze plants, castings for the war effort constitute our entire production. Together, these three great foundries are pouring an unheard of tonnage to shorten the war.

For armament today—for utility tomorrow.

HOWARD FOUNDRY COMPANY

4900 Bloomingdale Road Chicago

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

ARMY E NAVY

Awarded and reawarded for proficiency in the production of ordnance materiel.

HOWARD

ALUMINUM · BRASS · BRONZE · MAGNESIUM

HF CASTINGS

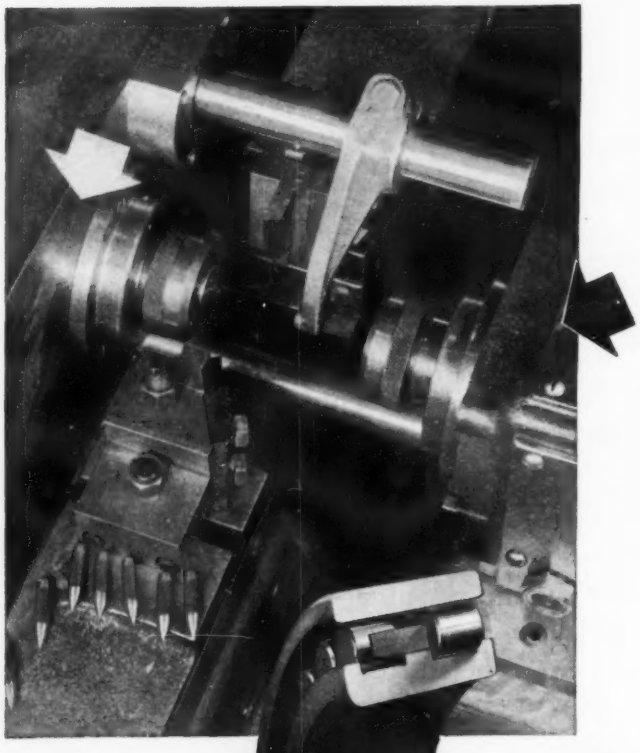
MAKING MESSAGES *for Hitler!*

High speed screw machine built by The Unit Machinery Co.

The more bullets our machines produce, the more messages we can send to Herr Hitler—grim reminders that an angry world is in a vengeful mood. And so machines—like this high speed screw machine—that work on bullet parts have spindles rolling on SKF Double Row Cylindrical Roller Bearings. SKF's are helping to "pass the ammunition" by insuring continuous peak production at high speeds . . . freedom from chatter . . . maintained accuracy . . . long life. Give a machine an SKF, and it will go over the top in Production.

5333

SKF INDUSTRIES, INC., PHILA., PA.



SKF

BALL AND ROLLER BEARINGS

ANOTHER REASON FOR SPECIFYING

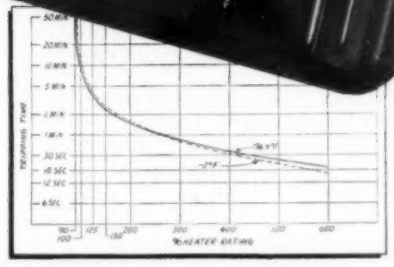
The Monitor
THERMALOAD V
SOLENOID STARTER

...Prompt Delivery

That's welcome news to the many who have wanted the positive motor protection that the Monitor Thermaload V assures. The Thermaload V is available from stock — shipped in accordance with existing priority regulations. No longer need your war-busy machines operate without proper safeguard against the hazards of excessive overload; no longer need you search for a "substitute."

It's your move! Now that availability has been added to proved - efficient performance, you can specify the Monitor Thermaload V for original equipment and replacement and be sure that you will get it.

Write manufacturer or your Monitor field engineer for shipping data, technical and installation details.



HERE'S PROOF that the Monitor Thermaload V gives maximum protection at boiler room heat or blizzard cold. Only five seconds variation in tripping time at 500% overload at temperature extremes that your machines probably will never have to overcome.

THE MONITOR THERMALOAD V GIVES YOU THESE FEATURES THAT ASSURE MAXIMUM PROTECTION

1—Exclusive Monitor Compensated Overload Relay. Ambient temperature does not affect its performance. Tests at —2°F and +136.4°F show only a few second differential in tripping time. The trip always occurs within the same time at a given percentage of overload. 2—Vertical Straight-Line Design. 3—Double-Break, Silver Contacts. 4—Easily-Interchangeable Coils for Different Voltages. 5—Resilient, Shock-Proof Mounting. 6—Tamper-Proof Protection.

Available in 1.5 to 7.5 H.P.—110 to 550 Volts (A.C.) and in combination units.

TheMonitorControllerCompany

GAY, LOMBARD & FREDERICK STS. BALTIMORE-2, MARYLAND

THE FOUNDATION FOR UNIFORM MEASUREMENT

DOALL Gage Blocks

Key to Mass Production

● In 1798 Eli Whitney went to Washington to demonstrate his idea of identical gun parts. Any part made in his shop was so accurate that it interchanged with the same part in any of his guns.

It was soon found, however, that his gun parts would not interchange with parts made by other gunsmiths, because no two shops had a common basis of precision measurements. For more than 100 years after that, there were no undisputed measuring devices.

By 1913, Gage Blocks were accepted by industry as the foundation of uniform measurement. Interchangeability of parts for any machine or equipment became possible between plants, states and even countries.

World War I was tooled up to 1/1000 of an inch; the needs of *this* war are accurate to 1/10,000 of an inch. When peace comes, these same accuracy requirements will carry over into mass production of civilian goods.

Metal working plants everywhere: Build Your Business on Today's Gage Block Standards. Have sets of DoAll Gage Blocks in each department to provide the necessary accuracies for tomorrow's interchangeability.

LOW COST KEYS TO PROSPERITY

Working Set. 81 blocks, accurate to 8 millionths of an inch, is adequate for average manufacturing uses.....$295.00

Inspection Set. 81 blocks, accurate to 4 millionths of an inch, recommended for tool room use and checking.....$350.00

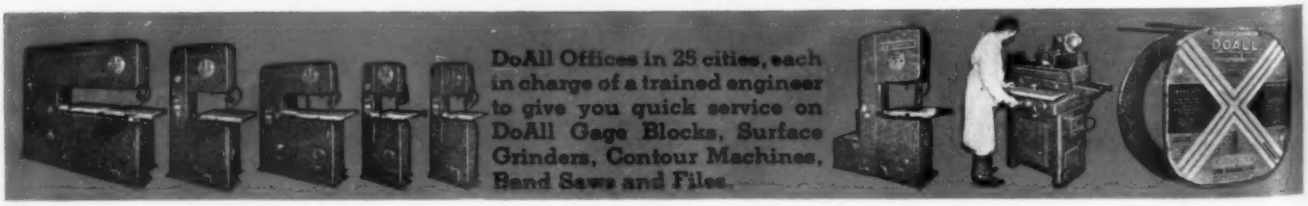
Laboratory Set. 81 blocks, accurate to 2 millionths of an inch, for use in a room with temperature controlled at 68° F.....$1450.00

Accessory Set. Laboratory instruments consisting of Master Surface Plate, Base Block, 4 sizes of Holders, Caliper Blocks, Center and Trammel Points, Vernier Gage, Master Squares and Parallels, Sine Bar with 3 straight edges, 2 Optical Flats and a Monochromatic Lamp. With this set you can build up snap gages and scores of setups for checking and inspection. In wood cabinets $495.00

FREE SOUND SLIDES—The DoAll man in your locality will gladly bring a portable projector to your plant and show a series of instructive slides on the Care and Use of Gage Blocks.

Write for interesting data about DoAll Gage Blocks.

SAVAGE TOOL COMPANY, Dept. AM, Savage, Minn.

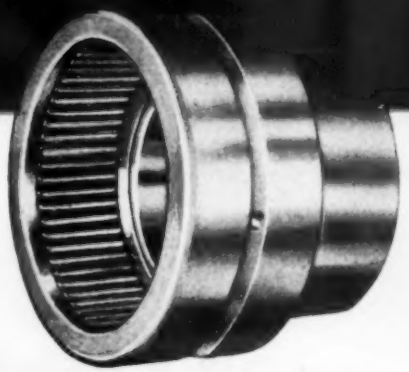

DoAll Offices in 25 cities, each in charge of a trained engineer to give you quick service on DoAll Gage Blocks, Surface Grinders, Contour Machines, Band Saws and Files.
DOALL

Meeting the Precision Requirements of

THOMPSON SURFACE GRINDERS

Thompson Surface Grinders are well-known for their high-speed, smooth, precision grinding. Contributing to this efficiency, Orange Roller Bushings are used in the Table Hand Feed Unit of the Type F Thompson Hydraulic Surface Grinders, shown herewith. After 4 years of continuous use, the Thompson Grinder Company reports, "Excellent performance"!

ORANGE ROLLER BUSHINGS



Many machinery manufacturers select Orange Roller Bushings for their great load carrying capacity in small space. However, in other applications requiring utmost precision (such as above), the unusually even, quiet, long-life operation of Orange Roller Bushings proves equally valuable.

This smooth action is the result of closer running clearances, achieved by holding roller clearances to a minimum through a rigid standardization of size, thus preventing rollers from running tangent to race.

Whether your product requires ruggedness — precision — *or both combined* . . . you have the answer in Orange Roller Bushings. Made in a complete range of types and sizes. Our engineers are glad to discuss any bearing application.

ORANGE ROLLER BEARING CO., INC.
ORANGE • NEW JERSEY

Mail Coupon for Engineering Data

Orange Roller Bearing Co., Inc., AM
Orange, N. J.

Please send me your Roller Bushing Data Book

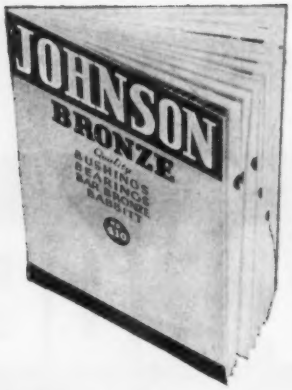
Name ..... Title .....

Company .....

Address .....

City ..... State .....

When did you CHECK *your* ELECTRIC MOTOR BEARINGS?



Replace

Manufacturers of armament can secure replacement bearings with a minimum of delay. Write for our new catalogue. It's free.

Most bearing failures are due either to improper fit or neglect. Proper care and attention will enable you to secure many additional hours of excellent service. In times like the present, it's a manufacturer's duty to keep every machine running at full capacity. Few parts carry the same responsibility as bearings. Why not follow these easy steps to insure the maximum service from each bearing?

Adopt a regular period of inspection. Make certain that every bearing is in perfect alignment. Keep the bearings clean. Take steps to avoid foreign matter of a gritty or abrasive nature from reaching the bearing. Lubricate at regular periods depending on the operating schedule. Make certain the lubrication is the correct grade and that it is clean.

If you will follow these instructions, you will find that Johnson sleeve type bearings will usually outlast the unit in which they are installed. Johnson Bronze Co., 515 South Mill St., New Castle, Penna.

They're the NUTS for tough fastening jobs

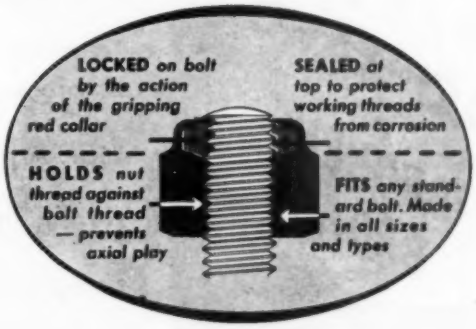
There are more Elastic Stop Nuts in America's planes, tanks, guns, naval vessels and production equipment than all other lock nuts *combined.*

All because these nuts stay put.

The reason is the red elastic locking ring in the top. This grips the bolt and holds the threads in pressure contact. And chance of wobbling and axial play is eliminated.

Looking ahead, we see better products and manufacturing equipment — we see time and money saved in maintenance and replacements — all because of these nuts that have proved they hold fast even under grueling vibration — that are easy to put on and take off yet lock automatically anywhere on the bolt.

Our engineers, experienced in solving fastening problems both in peace and war, are ready to share their knowledge with you. They will gladly work with you and recommend the correct Elastic Stop Nut to meet your need.


LOCKED on bolt by the action of the gripping red collar
SEALED at top to protect working threads from corrosion
HOLDS nut thread against bolt thread — prevents axial play
FITS any standard bolt. Made in all sizes and types

ELASTIC STOP NUTS

Lock fast to make things last

ESNA TRADE MARK

ELASTIC STOP NUT CORPORATION OF AMERICA
UNION, NEW JERSEY AND LINCOLN, NEBRASKA

To Assure Maximum Broaching Efficiency

UNIFORM PART HARDNESS *Is Essential*

PART TOO SOFT • POOR FINISH

PART TOO HARD • BROKEN BROACH

Every broach is specifically designed to do one particular job. It cannot do another job efficiently. A broach which is designed to cut steel that Rockwells 15 should not be expected to cut steel that Rockwells 35. One reason for this is that the hook or rake angle of the broach varies with the hardness of the material. The hardness of the material to be cut also affects other factors of broach design such as the pitch and step.

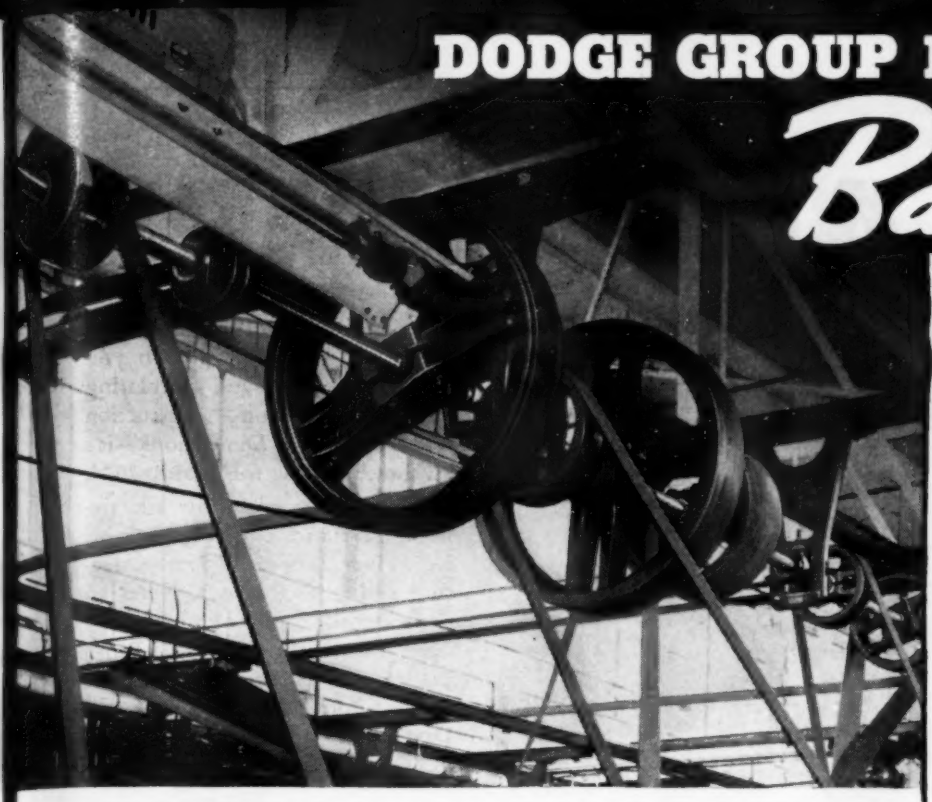
A piece that is too soft for the broach design will tear. A piece that is too hard will dull the teeth excessively. In fact, exceedingly hard pieces or spots will completely ruin the broach. It is, therefore, advantageous to properly control the heat treatment of parts to be broached.

COMPLETE BROACH SERVICE

DETROIT BROACH COMPANY

20201 SHERWOOD AVENUE • DETROIT, MICHIGAN

DODGE GROUP DRIVES BOOST *Battle Power*



"SHARE-THE-RIDE" Principle in POWER TRANSMISSION

Modern Dodge Group Drive applies share-the-ride principles to horsepower delivery. Taken from its source, capacity power, over short power "roadbeds," is delivered enroute to a group of production machines. Group drive permits one motor to do the work of several (a *powerful* advantage in these war days when conservation of materials and manpower is so vital).

Dodge Group Drive puts all the power in the job . . . boosts battle power, hastens Victory! By reducing connected horsepower, conservation is assured in motors, wiring, controls and other critical equipment and materials. Initial cost is low . . . fixed charges and maintenance costs are reduced. Cost of horsepower-delivery drops.

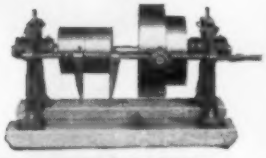
In the complete Dodge line are all the component parts for group drive . . . shaftings, hangers, pulleys, bearings, clutches . . . as well as individual motor drives, including D-V Matched Quality V-Belt Drives.

Contact nearest Dodge Distributor or write

DODGE MANUFACTURING CORPORATION, Mishawaka, Indiana, U.S.A.

DODGE SHAFT HANGERS

Shown here is the Dodge 4-point Pressed Steel Drop Hanger which may also be used as a Post or Bracket Hanger. 2-point and 4-point Iron Hangers also available.



DODGE COUNTERSHAFTS

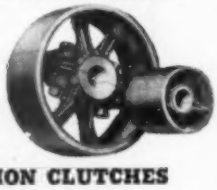
Can be supplied to meet any specifications with the proper type of hangers, bearings, pulleys and clutches to meet any requirement.

DODGE-TIMKEN Hanger Bearings

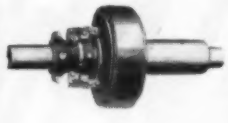
A completely assembled, factory adjusted, pre-lubricated unit delivered ready to install. Effectively sealed against admission of dirt or loss of lubricant.

DODGE STEEL SPLIT PULLEYS

Strong, rugged, light in weight. Easy to erect. Grooveless oval crown permits low belt tension—saves power. Also wood and iron pulleys for every service.



DODGE FRICTION CLUTCHES

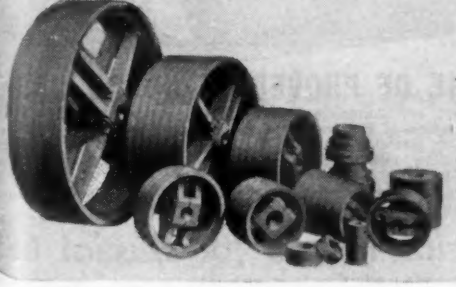


The Dodge Solid Friction Clutch shown here is particularly adapted for modern group drives and general power transmission service. Other types and sizes up to 1000 HP. at 100 R.P.M.

DODGE-TIMKEN PILLOW BLOCKS

For power transmission or machinery applications. Completely assembled, factory adjusted, pre-lubricated; seals exclude dust and dirt and retain lubricant. Easy to install. Long life (30,000 hours of service under conditions for which they are adapted) . . . (good for 50 million revolutions without re-lubrication, under normal conditions).

DODGE VICTORY WOOD SPLIT PULLEYS



Great tractive pull . . . long belt life . . . power saving. Balanced. Interchangeable bushings (for various sizes of shafts). Compression fastening to shaft. Easy to install. Light weight. They conserve metal!

Dodge VICTORY Wood Split Pulleys on a double reduction drive.

DODGE

MISHAWAKA

THROW ALL YOUR SCRAP INTO THE FIGHT! BUY MORE WAR BONDS!

THE RIGHT DRIVE FOR EVERY JOB

PUT *ALL* YOUR POWER IN THE JOB

INFORMATION ON

COOLANT PUMPS

A size and type to meet your needs. Capacities, 5 to 150 gpm — Heads 5 to 125 ft.

This new Ingersoll-Rand catalog gives you the information you want on coolant and circulating pumps. Application—Construction – Performance – Dimensions – it's all there. Just ask for catalog 7074.

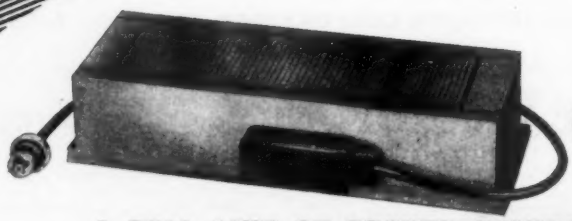
Furthermore, you can ask the Ingersoll-Rand engineer for his recommendations on pump selection and piping layout. He is an experienced engineer and you will find him in the Ingersoll-Rand branch office near you. Ingersoll-Rand Company, Cameron Pump Division, 11 Broadway, New York, N. Y.

Ingersoll-Rand

9-301

WALKER MAGNETIC CHUCKS

Style S Face Plate — in standard diameters from 10⅜" to 36⅜" inclusive.



No. 617 Bar Pole Face Rectangular Magnetic Chuck.

DEMAGNETIZERS

Walker DEMAGNETIZERS are available in standard D.C. and A.C. types for either 110 or 220 v. Ask for Bulletin K7 giving detailed specifications.

A FULL LINE OF PROVED STANDARD DESIGNS

Walker offers prompt and complete service on magnetic chucks by carrying in stock a considerable line of Rectangular and Rotary types for use on all surface and internal grinding machines built by American machine tool manufacturers. These units—for grinding, milling, planing and turning operations—are of proved design and are available in such a complete range of sizes as to enable you to select standard units for practically any chucking problem. Write for bulletin W4 giving detailed information.

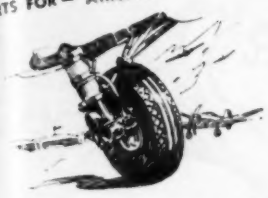
Also special CHUCKS *for special* NEEDS

The design of Walker Magnetic Chucks is such that "specials" can be developed and furnished at prices only slightly more than standard units. If you require special magnetic chucks for special purposes, consult Walker and be assured of prompt, economical service.

O. S. WALKER CO., INC.

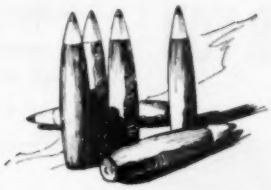
WORCESTER, MASS.

PARTS FOR — AIRCRAFT



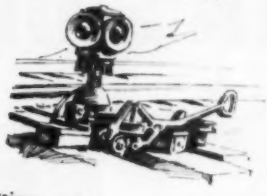
Tail wheel assemblies, actuating cylinders and engine forgings. Brake lining. Camshaft and starter bearings.

PARTS FOR — BATTLE



Shell and shot forgings. Cast bomb parts. Steel armor plate castings. Ammunition hoists. Torpedo parts.

PARTS FOR — TRACKWORK



Crossings, switch stands, switch point locks, guard rails, rail lubricators. Trackwork for industrial equipment.

You Name the Part—

PROBABLY WE MAKE IT

Brake Shoe **MAKES PARTS** for original equipment and for maintenance; parts that are upset and drop forged; molded fabrics and plastics; ferrous and non-ferrous castings. In war, as in peace, Brake Shoe ships millions of parts to thousands of manufacturers, in many fields of industry.

The services of our research and development engineers are available for immediate or post-war problems.

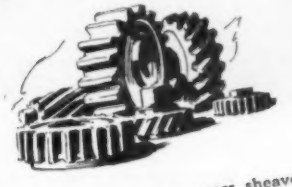
AMERICAN BRAKE SHOE COMPANY, 230 PARK AVENUE, NEW YORK, N. Y.

AMERICAN
Brake Shoe
COMPANY

58 PLANTS SERVING INDUSTRY AND TRANSPORTATION

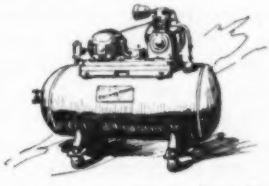
American Brakeblok Division	*Detroit, Mich.*
Ramapo Ajax Division	*New York City*
American Manganese Steel Division	*Chicago Heights, Ill.*
Brake Shoe and Castings Division	*New York City*
Kellogg Division	*Rochester, N. Y.*
American Forge Division	*Chicago, Ill.*
Southern Wheel Division	*New York City*
National Bearing Metals Corp.	*St. Louis, Mo.*

PARTS FOR — MANUFACTURERS



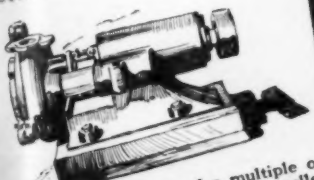
Manganese steel chain, gears, sheaves, sprockets and wheels. Hard surfacing welding rods. Forgings, castings.

PARTS FOR — GARAGES



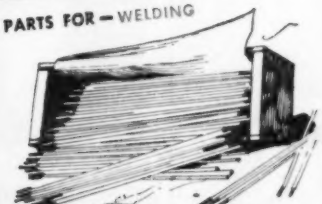
Air compressors. Car washers. Brake lining, fan belts, clutch facing, radiator hose, auto lifts.

INDUSTRIAL PUMPS



Complete assemblies for multiple or two van closed or open impeller type. Single stage self-priming pumps.

PARTS FOR — WELDING

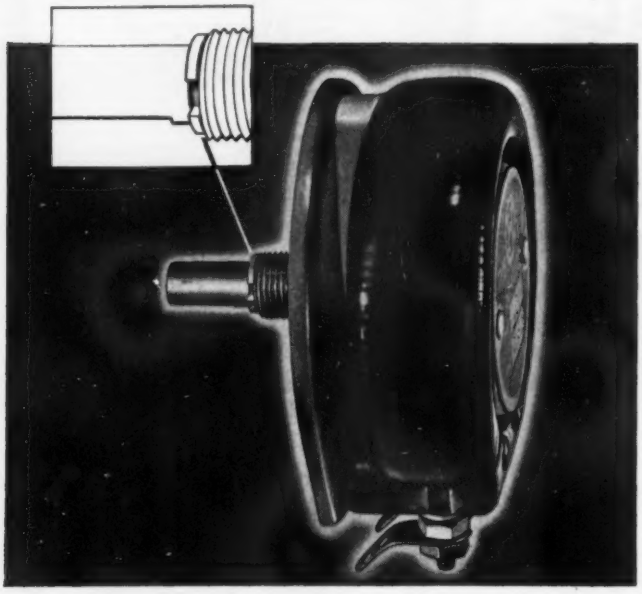


Welding rods, flux, nickel-manganese filler, applicator bars. Welding products for repair of ferrous equipment.

PARTS FOR — SHIPS

Strut and stern tube bearings. Carbon steel castings for davits and winches. Bronze castings for engines.

LET A SIMPLE RETAINING RING SAVE METAL AND MONEY FOR YOU



Every shoulder on your machines or on your metal products should be examined to see whether or not smart engineering could take advantage of these modern artificial shoulders on shafts or in housings.

It is needless waste in most instances to turn your shoulders by cutting down larger shafts, when you can groove a smaller shaft and apply a spring steel retaining ring. You'll get excellent results at unbelievable savings.

It's expensive to hold a mechanism in place with unnecessarily big shoulders or collars,—or to temporize with small cotter pins, etc. Let us show you how spring steel retaining rings can do a thoroughly efficient job for you.

More and more retaining rings are being used in these days of necessary economy. Every ounce of metal and every cent of cost is more important today than ever before.

Write today for our descriptive folder on Retaining Rings.

THE NATIONAL LOCK WASHER COMPANY
Newark, N. J., Milwaukee, Wis., U. S. A.

..WAS ALL RIGHT IN ITS DAY!

TODAY—INDUSTRY *demands* TORIT DUST COLLECTORS

High speed production today requires efficient, up-to-the-minute precautionary measures, of which "dust control" is a major factor. Torit Self-Contained Dust Collectors are the answer, as so many plants and factories have found out. There are over 5,000 users of Torit Dust Collectors today. What greater evidence of satisfaction could one ask?

Torits are portable, easy to install, economical to operate. One or more installations oftentimes prove more practical than costly central dust collecting systems. Get the story today . . . Send for your bulletin giving full details.

TORIT MANUFACTURING CO.
280 WALNUT ST.
ST. PAUL, MINN.

Get the story today—Send for your bulletin giving full details

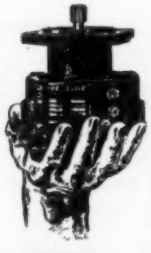
TORIT Dust Collectors
SELF-CONTAINED UNITS

Why stop with elevators?

Hydraulic elevators have served continuously for fifty years . . . but hydraulics didn't stop with elevators, came up fast the last decade.

Developed primarily for aircraft as auxiliary power for landing gear, fuel pumps, gun turrets, flaps, ailerons, bomb bays . . . and tested all over the world under combat conditions . . . Dowty has the lightest, smallest, surest and most efficient hydraulic system available, readily suited to the needs of industry, transportation and shipping.

The Dowty *Live-Line* Pump weighs only 8 pounds, delivers up to 1,500 p.s.i., automatically stops pumping at a predetermined pressure point, starts again when pressure falls . . . delivers a constant steady pressure wherever pipes can be led, affords a reliable, efficient and convenient power source. The system has fewer parts, pipe and plumbing than conventional systems; with minimum risk of leakage, accident, power failure, fire hazard. Singly or in series, the Dowty *Live-Line* Pump will supply power for many and varied operations.



Today, all our production is for war . . . but manufacturers looking ahead to reconversion for peace . . . will want to know more about Dowty now. Consult our engineers—soon!

DOWTY

EQUIPMENT CORPORATION

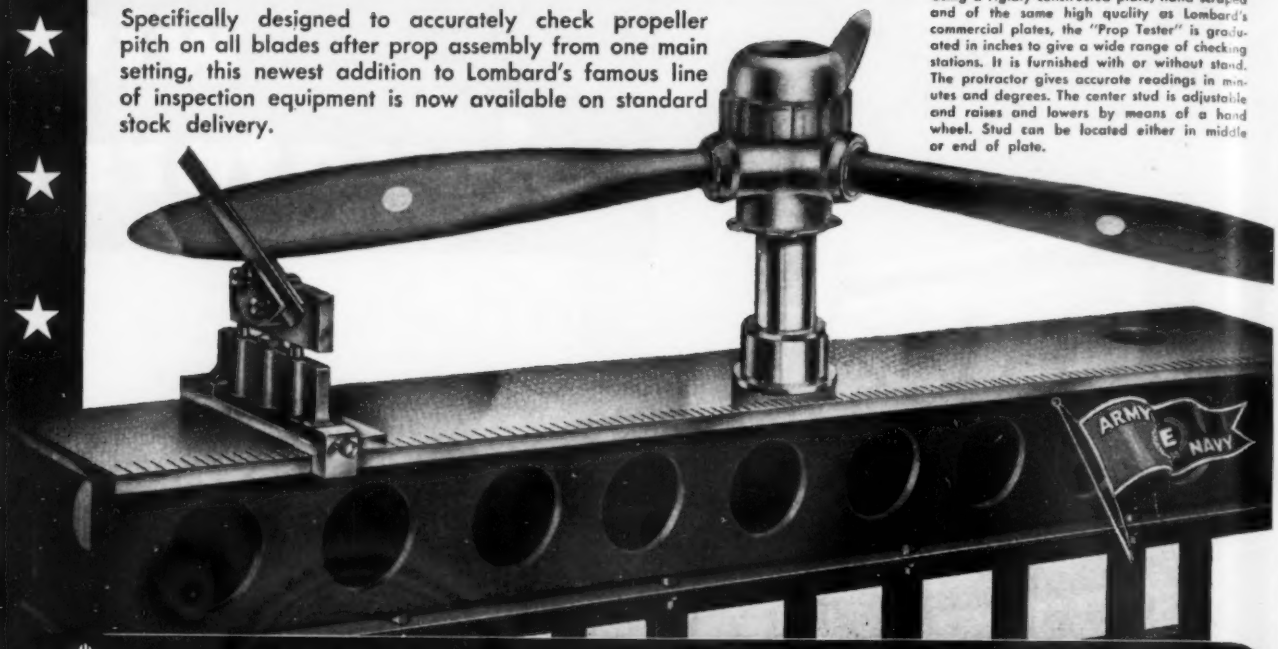
LONG ISLAND CITY • NEW YORK

ASSOCIATED WITH: DOWTY EQUIPMENT, LTD., CHELTENHAM, GLOS., ENGLAND . DOWTY EQUIPMENT (CANADA) LTD., MONTREAL.

LOMBARD Propeller Protractor and Checking Plate

Specifically designed to accurately check propeller pitch on all blades after prop assembly from one main setting, this newest addition to Lombard's famous line of inspection equipment is now available on standard stock delivery.

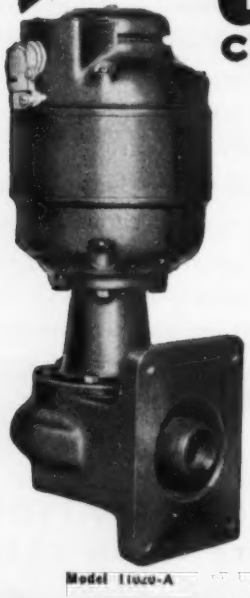
Using a rigidly constructed plate, hand scraped and of the same high quality as Lombard's commercial plates, the "Prop Tester" is graduated in inches to give a wide range of checking stations. It is furnished with or without stand. The protractor gives accurate readings in minutes and degrees. The center stud is adjustable and raises and lowers by means of a hand wheel. Stud can be located either in middle or end of plate.



LOMBARD GOVERNOR CORPORATION
500 MAIN ST., ASHLAND, MASS., U. S. A.

For HIGH-SPEED Production

GUSHER COOLANT PUMPS



Full ball bearing design minimizes friction . . . no pump priming . . . not injured by small chips and grit . . . split-second control, these and other features of Gusher Coolant Pumps help you meet your high speed production schedules.

There's a "Gusher" to meet your needs. Types and sizes from 1/10 to 2 h.p.

Write for data and specifications

Model 11020-A

THE RUTHMAN MACHINERY CO.
1809 READING ROAD CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

SMITH MASTER SURFACE PLATES

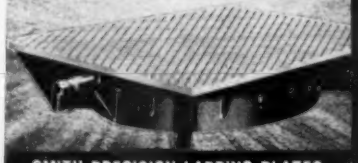
Precisely... **RIGHT**

Present day inspection and assembly demands surface plates of utmost precision accuracy. Plants engaged in aircraft and ordnance production throughout the country have come to depend on Smith Plates. Their complete satisfaction is evidenced by frequent reorders. If your requirements call for precision accuracy, wire, phone or write.

SMITH TOOL & ENGINEERING CO.
851 North Sandusky St., Bucyrus, Ohio

Available Sizes

8" x 12"	18" x 18"	20" x 30"	30" x 60"	
9" x 14"	18" x 24"	24" x 38"	36" x 68"	
12" x 18"	24" x 24"	30" x 36"	48" x 96"	

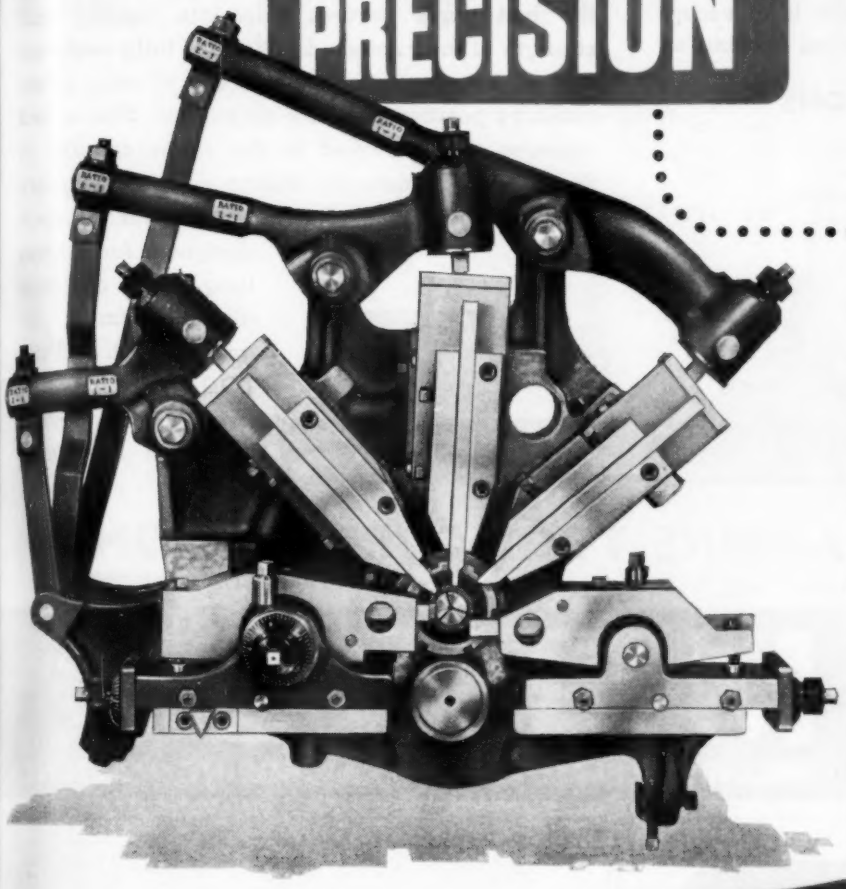


SMITH PRECISION LAPPING PLATES

On specifications requiring a total flatness tolerance of one ten-thousandths of an inch, medium size Smith Master Surface Plates have successfully met the test to the entire satisfaction of hard-to-please users.

The same close tolerance accuracy for developing a true plane when lapping metal to metal joints, characterizes Smith Precision Lapping Plates in the same manner as will be found in Smith Master Surface Plates.

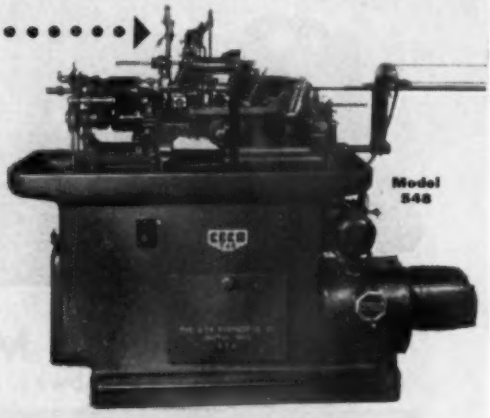
One-Operation PRECISION



CECO

SWISS TYPE *Automatic*

UNIVERSAL PRECISION SCREW MACHINES



Highlight Features!

BAR CAPACITY: ⅜" and ½"

4 or 5 RADIAL TOOL SLIDES.

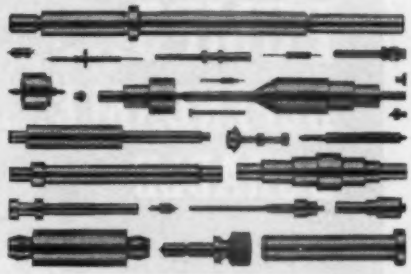
MAXIMUM TURNING LENGTH: 4" with flat cam.

MASTER SPEED RANGER: Varies Spindle speed from 675 to 7500 R.P.M. at the turn of a handwheel.

PRECISION ROLLER BEARING SPINDLE: Always in adjustment.

CONSTANT RISE FEEDING MECHANISM gives extreme feeding accuracy.

Serving some of America's greatest precision-makers, including Norden, Kollsman, Sperry, Bendix and many others, the Ceco Automatic is revolutionizing the mass production of small intricate parts—cutting tool costs, speeding the set-up and producing *one-operation precision work* with amazing economy and efficiency.



THIS BOMBSIGHT PINION SHAFT IS AN EXAMPLE OF CECO'S ONE-OPERATION, HIGH-SPEED PRECISION PRODUCTION

Produced by Ceco *in one operation* instead of three formerly required, and with single tip tooling, thereby eliminating form tools commonly used, is the Bombsight part reproduced above.

Shown on this page are a few of the hundreds of parts Ceco produced in *one operation* with extreme accuracy and high finish. Odd shapes and multiple diameters, also complicated forms, including tapers, bevels, radii, etc., are Ceco-produced with single tip tools. Result—quick set-up, low cost, and faster high precision production of intricate parts. For information and literature write:

THE CITY ENGINEERING CO.
DAYTON, OHIO

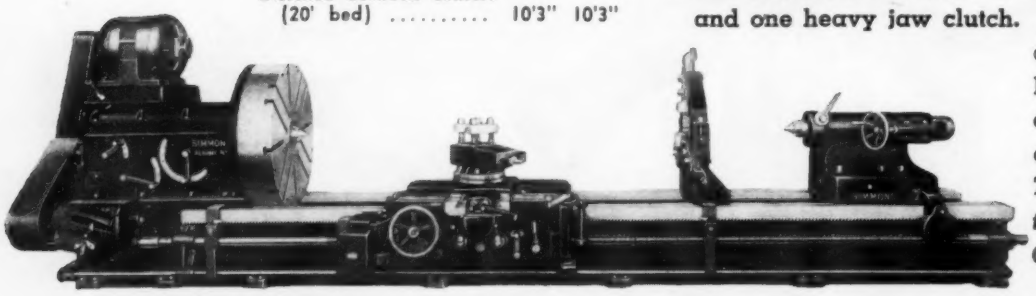
Since 1909, Designers and Builders of Tools, Dies, Jigs, Fixtures, Gages and Special Machinery.

48" and 54" HEAVY DUTY LATHE

Simmons Heavy Duty Engine Lathe is of exceptionally rugged construction. A long bearing on the bed ways assures adequate rigidity and strength of the headstock. Head is fully enclosed and all bearings and gears are constantly lubricated by positive pressure oil pumps. Nine speed changes are provided to the main spindle of the headstock through sliding spur tooth gears and one heavy jaw clutch. Boring bar tailstock designed for boring long holes of large diameter (max. diameter 8"). *Write TODAY for Descriptive Bulletins Giving Complete Details.*

SPECIFICATIONS

	48"	54"
Swing over bed	50"	55½"
Swing over carriage	36"	42"
Distance between centers (20' bed)	10'3"	10'3"



SIMMONS MACHINE TOOL CORPORATION

Main Office: 1759 NORTH BROADWAY, ALBANY 1, N. Y. *New York Office:* 149 BROADWAY

SIMMONS

LATHES · TURRET LATHES · MILLERS · PLANERS · 6" BAR BORING MACHINES

GILBARCO COOLANT PUMPS... DEPENDABLE... DURABLE

MODEL CE
Immersion Type

● One of a complete line of pumps for all machining operations. ● Built for twenty-four hours a day service. ● Instantaneous coolant delivery, self-priming, never becomes airbound. ● Does not build up pressure at slow speeds. ● Unharmed by abrasives in liquid—or by running dry. ● Built by one of the country's largest pump manufacturers.

Write or wire for literature, prices and deliveries.

GILBERT & BARKER MFG. CO.
WEST SPRINGFIELD, MASS.

MARK IRON, STEEL and CARBIDES

The Original

Etchograph

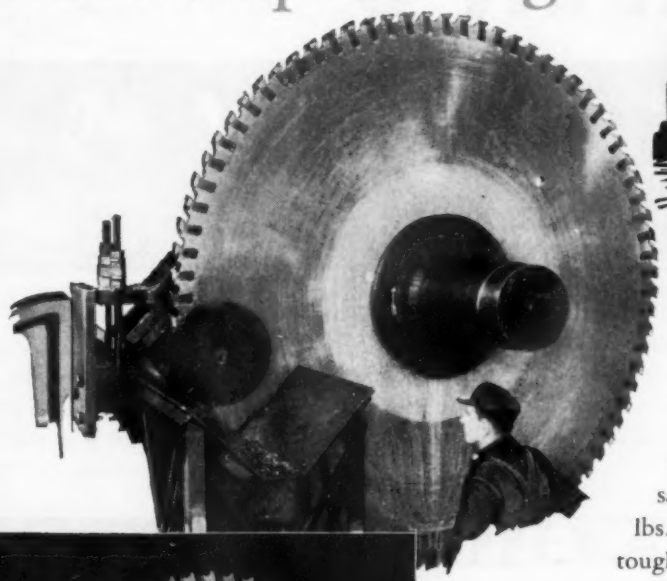
Way

Mark parts in process, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides—quickly—plainly.
Three sizes to meet all requirements.

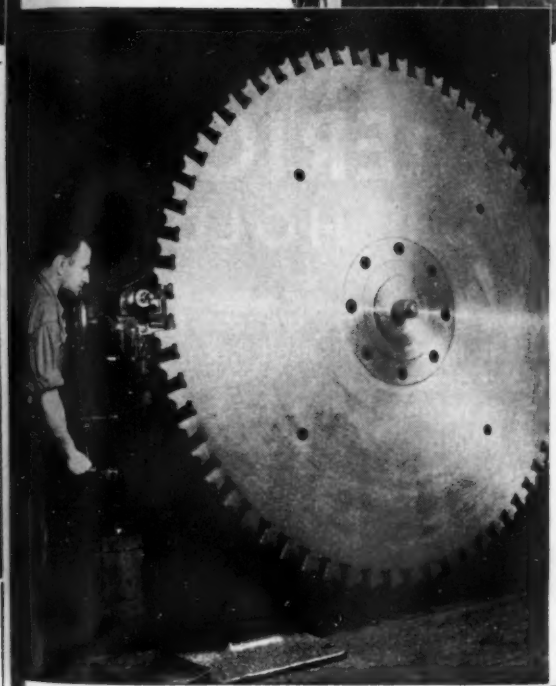
Write for circular and prices

BREWSTER-SQUIRES & CO.
50 CHURCH ST. NEW YORK, N. Y.

The world's largest saw... *by Disston* . . . speeds wartime shipbuilding



A plant building locomotives, combat tanks and important marine equipment uses this immense saw to slice through large thrust-shafts, crankshafts and connecting rods. This Disston saw is 120 inches in diameter—weighs 2,200 lbs.—and its teeth of fine Disston Steel cut tough alloy steel shafts with the greatest of ease!



No other manufacturer has ever made an inserted tooth metal cutting saw in this giant size. It's another Disston outstanding achievement—the kind of successful toolmaking that means to you, *extra* quality and *plus* performance in every standard Disston tool you buy.

Disston wood and metal cutting saws, files, hack saw blades, tool bits, machine knives and other tools are on 'round-the-clock duty everywhere on American wartime production lines . . . And to keep *all* makes and types of tools working better and longer, Disston will supply any manufacturer with FREE Conservation Control instruction cards—covering 34 different types of cutting tools.

Quality tools and practical working help will conserve man-minutes and speed the day of Victory. For any information on Disston products or free cards write Henry Disston & Sons, Inc., 720 Tacony, Philadelphia 35, Pa., U. S. A.

Experienced toolmaking and fine craftsmanship at Disston made this saw possible . . . Some of the other Disston precision-made products are Solid and Inserted Tooth Milling Saws; Metal Cutting Band Saws; Carboloy-fitted Circular Saws for non-ferrous metals; and Tool Bits.

DISSTON

ESTABLISHED 1840

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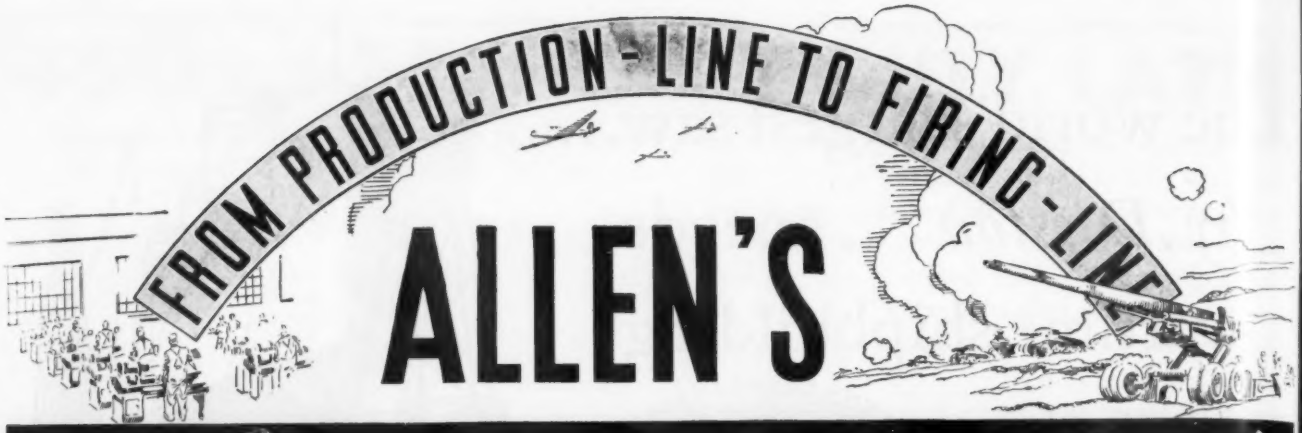
Conserve Man-Minutes and help win the war



ALLEN'S

LINE OF DUTY

All the way from production-machines to battle machines, — *there's* the line of duty of the ALLEN Line. "Allens" hold together your machine-tool assemblies. And they hold together the weapons these tools produce. Keep mechanisms solidly intact on production-line *and* firing-line.

"Pressur-formd" Cap Screws, formed and threaded by pressure processes. The original *cold-drawn* Hollow Set Screws. Flat head Cap Screws, socketed Pipe Plugs, *Tru*-Ground Shoulder Screws and Dowel Pins . . . Dedicated *and qualified* to hold all gains in machine and arms development.

The Allen Mfg. Company ★ ALLEN ★ Hartford, Conn., U. S. A.

TUTHILL'S V-BELT DRIVE FOR VICTORY

LONG LIFE — NEGLIGIBLE MAINTENANCE IN HANDLING HEAVY LIQUIDS

From one end to the other, this compact V-belt driven viscous liquid Tuthill pumping unit is engineered for long, dependable and economical service in war-time as in peace. Quiet in operation, simple in construction, it is of the positive-displacement, internal-gear rotary type that has made Tuthill Pumps synonymous with dependability in industry. Features include outboard ball-bearing shaft support, belt tension adjustment by one set-screw, wide range of speeds, capacities and pressures, inexpensive replacements, negligible maintenance.

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Write for Viscous Liquid Pump bulletin

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AMERICAN TOOL HOLDERS

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Here is a really fine tool room tool holder that soon pays for itself because of advanced design details.

Each holder holds three sizes of bits—each bit may be held in four positions—the holder grips the tool with a wide, immovable grip. Write today for descriptive folder.

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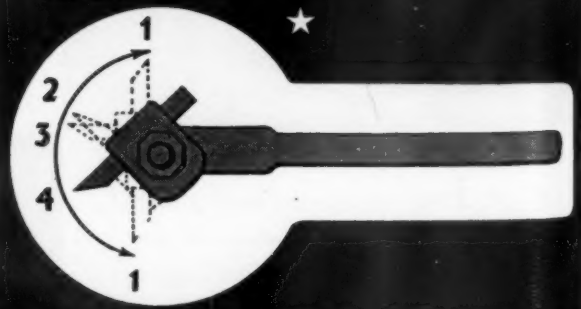

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BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

A WAR PRODUCTION MACHINE WITH AN EYE TO THE FUTURE

No doubt you are making fighting materials for America now — but when peace comes you'll go back to peace production! The Smallpeice Production Lathe spells equal success for war *or* peace manufacturing! It's the ideal production machine for every type of regular turning, boring facing, and profiling — with versatility that means a *real* investment.

Smallpeice is quick — efficient — essential, and is Napoleonic in size as well as accomplishment, for it occupies only a small portion of your floor space! *Little giant* action gets results. Unit design with provisions for a wide range and variety of slides, overarms, and similar attachments for work up to 58" between centers, and 18" swing, means that your Smallpeice Production Lathe is rapidly converted into a special purpose automatic!

Let our engineers assist you in solving your problem.

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Smallpeice Ltd., Great Britain

"SMALLPEICE"— MACHINE TOOLS AND EQUIPMENT MANUFACTURED IN U.S.A. AND GREAT BRITAIN

NO. 2 AMERICAN PLAIN MILLING MACHINE . . . .

designed and built to meet modern requirements in speed and accuracy

PROVIDING:

Heavy, accurately ground spindle running in heavy phosphor bronze bearings compensated for wear. Standardized No. 40 taper spindle nose.

Infinite spindle speeds—from 25–500 R.P.M.—obtained instantly while machine is in operation by a single direct reading dial within easy reach of operator.

U. S. Vari-Drive ball bearing motor located in base with magnetic push button control drives spindle through TWIN-DISC Duplex Machine Tool Clutch and multiple V-belt.

CONDENSED SPECIFICATIONS

Table Working Surface—46" x 10½"
T-Slots—three 11/16"
Longitudinal Power Feed—25"
Range per Rev.—.005" to .212"
Transverse Power Feed—9"
Vertical Hand Feed—19"
Feeds (geared)—16

Send for complete details

J. L. LUCAS & SON, Inc.
Bridgeport, Conn.

Prompt deliveries with high priorities

Added Strength Saves Replacements

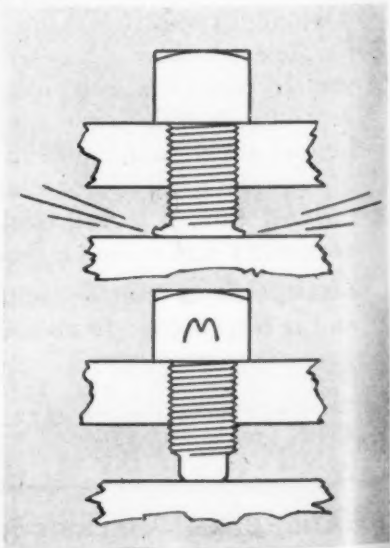
These Screws Have a Place in Your Plant

Where tremendous gripping power is necessary and projecting heads present no hazard, there is no substitute for just plain strength. Broken screws, upset points and fatigue failure can be avoided by specifying stronger screws.

Mac-its
PRONOUNCED "MACK-IT"

OTHER MAC-IT PRODUCTS INCLUDE:
Hexagon Socket Cap Screws • Hexagon Head Cap Screws • Hollow Set Screws Hollow Pipe Plugs • Stripper Bolts

Mac-it Square Head Set Screws are heat-treated for maximum torsional strength and to resist upsetting of the points. A ⅝" Mac-it, for example, has a gripping power of more than 25 tons!



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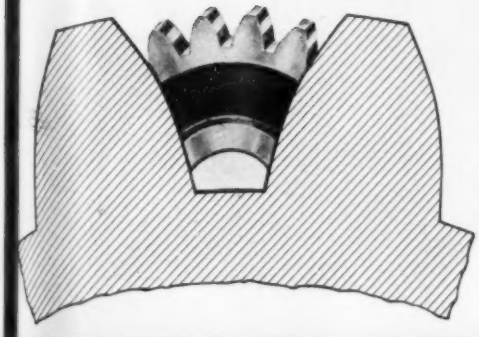
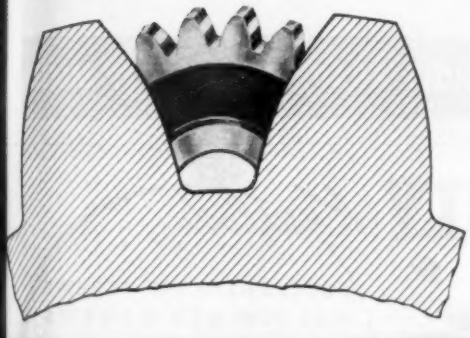
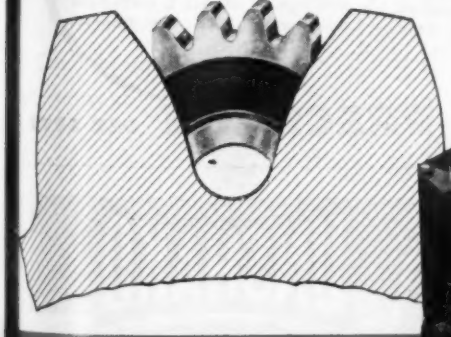


STRAIGHT ROOT



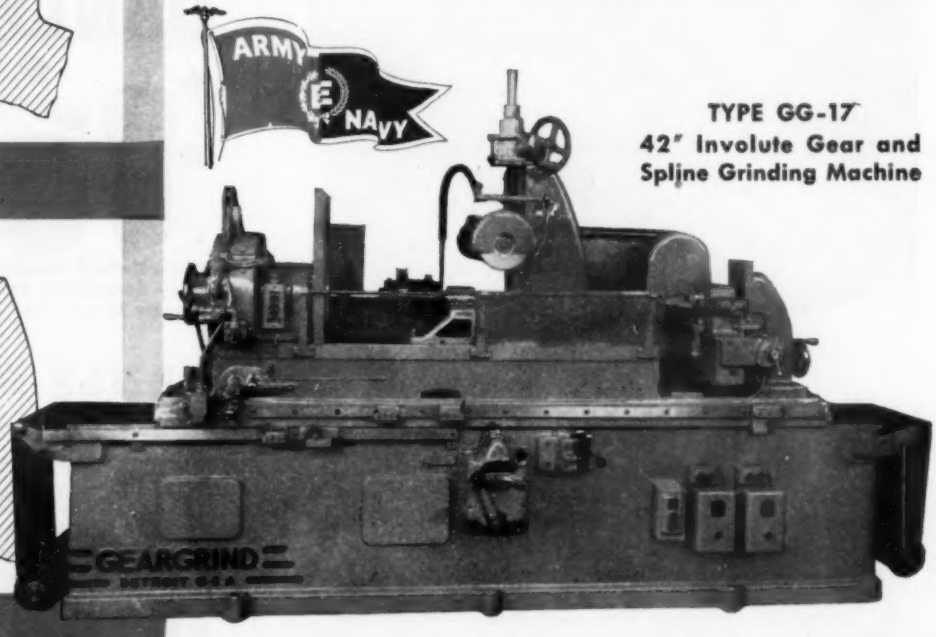
DEFINITE RADIUS FILLETS



FULL RADIUS ROOT

GEARGRIND Formed Wheel Grinders give you definite control of roots—just what your gear design calls for. Full radius roots and definite radius fillets that give absolute line continuity for carrying the greatest possible loads—or plain, straight roots—GEARGRIND handles them all.

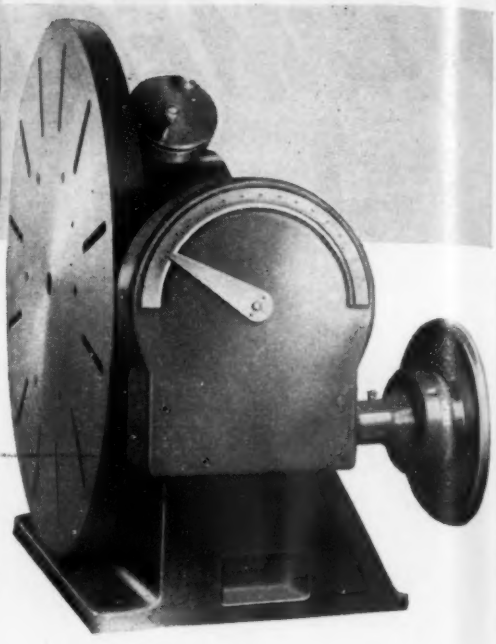
For external and internal gears, external and internal involute splines, straight splines, serrations and racks, you can count on GEARGRIND for *absolute control,* constant production and the finest possible finish. Write today for full information.



TYPE GG-17
42" Involute Gear and Spline Grinding Machine

The GEAR GRINDING MACHINE COMPANY
DETROIT, MICH. U.S.A.

Announcing ROTAB



A device which makes for speed, simplicity, and accuracy in checking or machining all angles of large cumbersome castings.

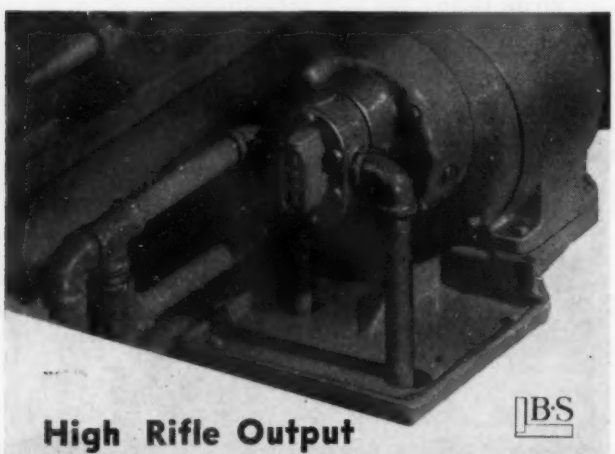
Once the work is fastened onto the 36-inch table, it can be entirely checked for all its angles without disturbing the original clamping. The table can be rotated to any degree, and can also be set at any angle from the vertical to the horizontal, and even 30 degrees below in the opposite direction. Graduated dials register degrees and minutes, with a 10-inch sine bar provided for closer settings. All can be locked in fixed position.

Because of its ability to assume a wide range of angles, the ROTAB presents an additional distinction. It can be utilized also as a holding fixture for boring mill setups.

BUY WAR BONDS

Send for illustrated folder giving complete information with dimensions.

MACHINE PRODUCTS CORPORATION • 6769 EAST McNICHOLS ROAD, DETROIT 12, MICH.



High Rifle Output Depends on Pumps

to maintain uninterrupted hydraulic operation of rifling machines. Brown & Sharpe Motor Driven Rotary Geared Pumps were chosen for this vital war need because of unfailing performance

Motor Driven Rotary Geared Pumps as well as other Geared, Vane and Centrifugal Pumps, are shown in our pump catalog. Copy forwarded upon request. Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

BROWN & SHARPE PUMPS

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Danly Commercial Sets
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HOLLOW SET SCREWS

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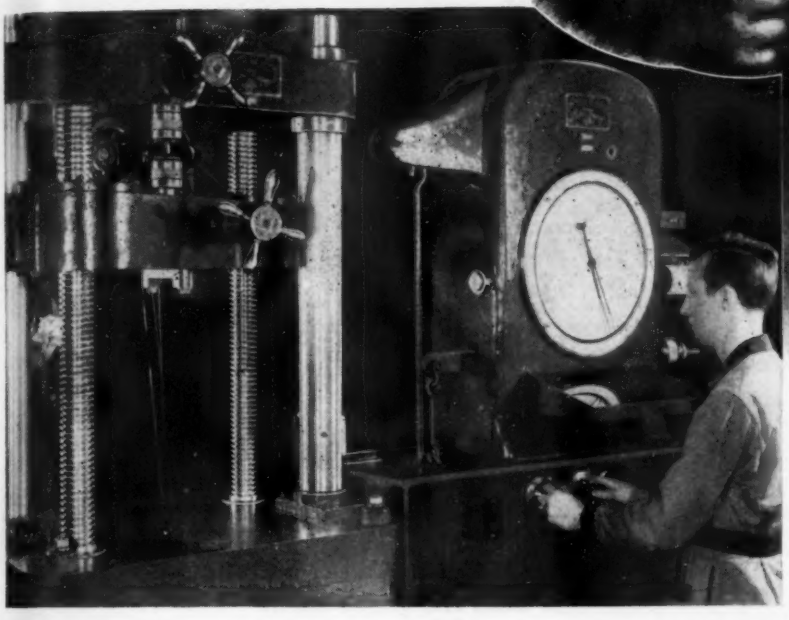
DANLY PRECISION DIE SETS

GARGANTUA is a sissy...



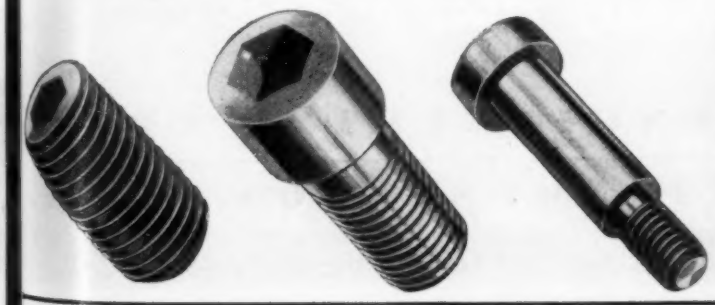
. . . compared to the mechanical brute that proves the surplus tensile strength of Parker-Kalon Socket Screws

This 100,000 pound capacity Olsen Universal Tester in the P-K Laboratory checks every batch of Parker-Kalon Cold-forged Socket Screws to make sure that they meet the high Parker-Kalon standards for Tensile Strength.

The tensile test is only one of 16 check-ups that are made to assure the unfailing performance of P-K Cold-forged Socket Screws. This rigid routine of *quality control* eliminates the "doubtful screws" – screws that *look* all right, but may fail to *work* right. Socket Screw users need this protection today more than ever. Specify Parker-Kalon next time you order . . . it costs no more. Parker-Kalon Corp. 194-196 Varick Street, New York, N. Y.

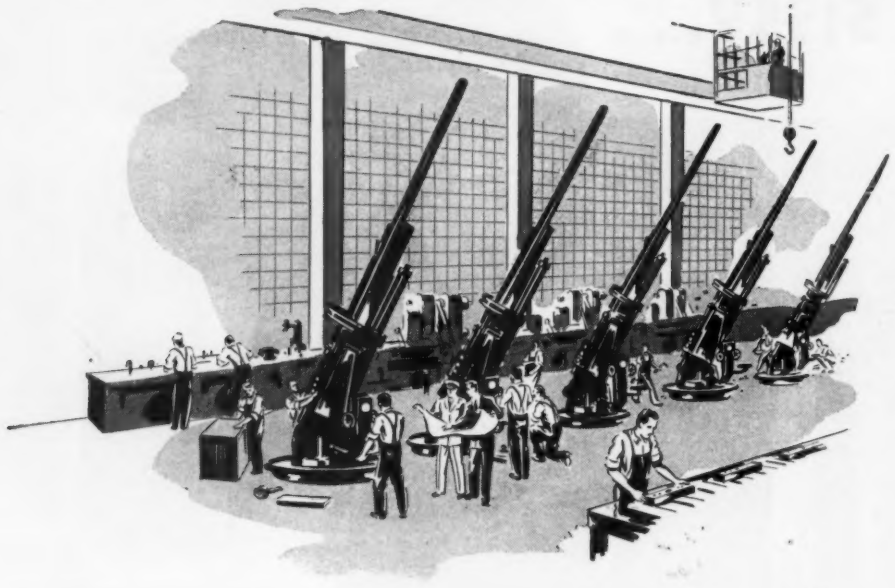
This 16-point "Quality-Control" protects P-K Socket Screw Users

1–Chemical Analysis. 2–Tensile Strength. 3–Ductility. 4–Torsional Strength. 5–Ability to take Shock Loads under Tension. 6–Resistance to Shock Loads under Shear. 7–Hardness. In addition, there is a rigid inspection of these essentials: 8–Head Diameter. 9–Head Height. 10–Concentricity of Head to Body. 11–Socket Shape. 12–Socket Size. 13–Socket Depth. 14–Centricality of Socket. 15–Class 3 Fit Threads. 16–Clean Starting Threads.



PARKER-KALON
Quality-Controlled
SOCKET SCREWS

ALL OUT OF *One Part* STOPS "ALL-OUT" PRODUCTION



YOU can't maintain all-out production when you are all out of even *one* part! Quantities "too little or too late" . . . or off standard quality that forces rejections of parts . . . can seriously penalize the war effort! . . . If one or more difficult parts are hazards to peak production in your plant now, or are "headaches" in your plans for future post-war products . . .

Contact KAYDON

CAPACITY Immediately AVAILABLE for ball and roller BEARINGS Size 6″ to 60″

Here is an organization with a staff of engineers who have had decades of experience in metallurgy, precision metal-working methods, and plastics. Their experience is fortified by progressive research, modern laboratory, tool room and quantity production facilities — all of which permit Kaydon to tool up for mass production of difficult high-precision parts, on a speed schedule considered unnecessary before global war problems confronted industry. . . . Kaydon has facilities available now for some additional war production and post-war product development.

For excellence in production of extremely precise, unusually large ball and roller bearings.

ARMY E NAVY

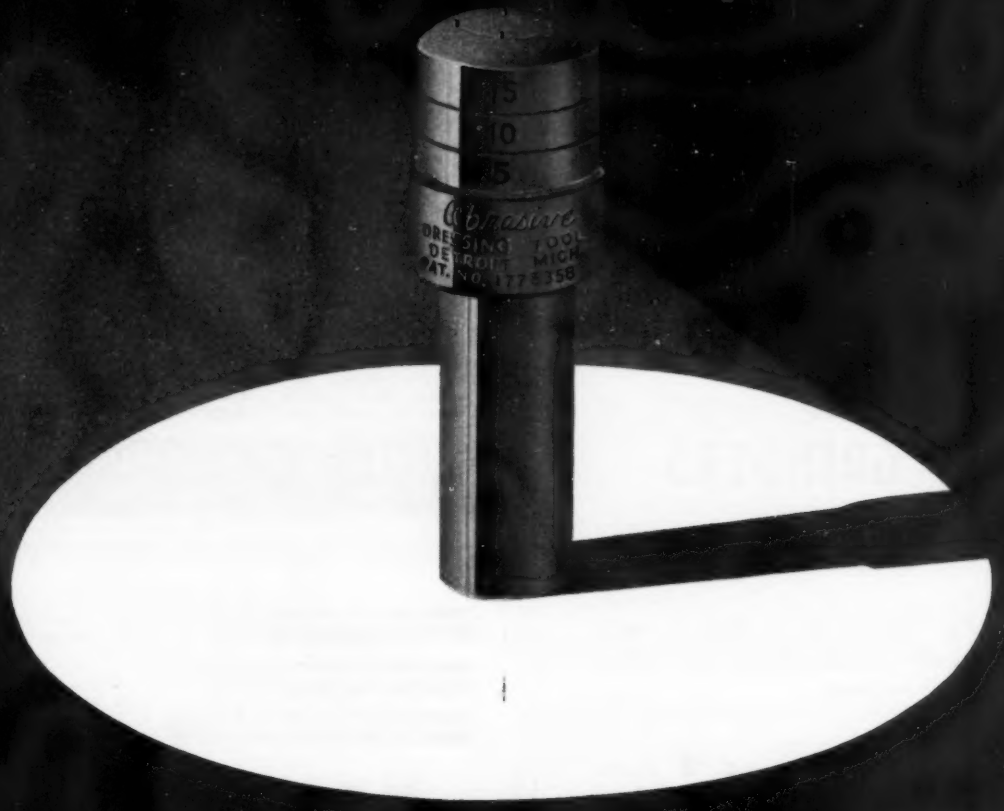
THE KAYDON ENGINEERING CORP.

McCRACKEN STREET • MUSKEGON, MICH.

Specialists in Difficult Manufacturing

WHEN GRINDERS STOP

Waste Begins



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RED BAND DIAMOND TOOLS

Third Generation of Diamond Experience

ABRASIVE DRESSING TOOL COMPANY ★ DETROIT

Grand Rapids

COMBINATION DRILL AND TAP GRINDERS

Model 10-B

Sharpens Taps, 2, 3 and 4 Flute, Right or Left Hand. Sizes #6 to one and one half inches.

Sharpens Drills, 2 and 3 Flute, Straight or Taper Shank. Sizes from one eighth to one and one half inches.

"Sharp Drills and Taps Cut Holes in Rising Production Costs."

Other Combinations Also Available

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Write for complete descriptive literature

GALLMEYER & LIVINGSTON CO.

300 Straight Ave. S.W.

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DON'T WAIT FOR TURRET LATHES

Convert any engine lathe into a turret lathe in 15 seconds with JEFFERSON TURRET ATTACHMENTS. To fit bench lathes and lathes up to 24" swing.

• This new modern TOOL-POST TURRET (below, right), made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held.

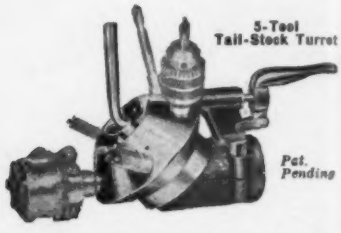
6 Days Delivery

Pat. Pending

4-Tool Tool-Post Turret

• Then there's the completely modernized 5-tool TAIL-STOCK TURRET (below right), made in 4 sizes to fit small bench lathes and lathes up to 24" swing. Also the adjustable PULL-FEED LEVER. Jefferson Turrets are real production tools—substantial, rigid, accurate. They must not be confused with the small make-shift gadgets now on the market.

The Jefferson Bull-Dog Precision Milling Machine. Obtainable Power or Hand Feed.



5-Tool Tail-Stock Turret

Pat. Pending

• **ALSO—*Milling Machine Dividing Heads, Vises, Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles.***

JEFFERSON MACHINE TOOL CO.

SO. SWEENEY, CUTTER & FOURTH STS. CINCINNATI, OHIO

BOKUM TOOLS

Accept More Feed—Increase Production

Since the greatest cutting force is always directed toward its largest cross section, the Bokum Tool can accept more feed than ordinary boring tools; therefore, it completes the job faster.

Original form of tool is never changed through resharpening.

For complete description of these tools send for the catalog that meets your particular needs.

For High Speed Steels, No.K-1139
For Carbide-Tipped, No. K-398

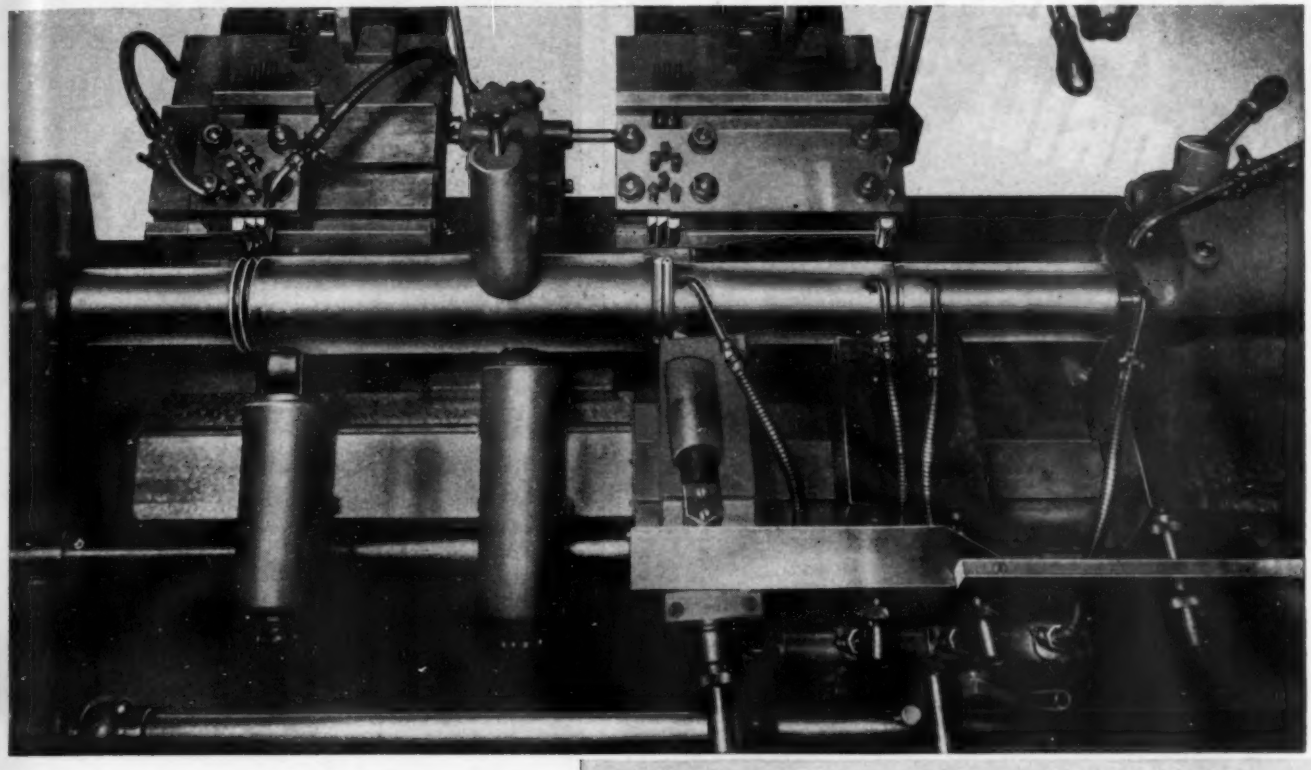
BUY WAR BONDS

BOKUM TOOL CO.

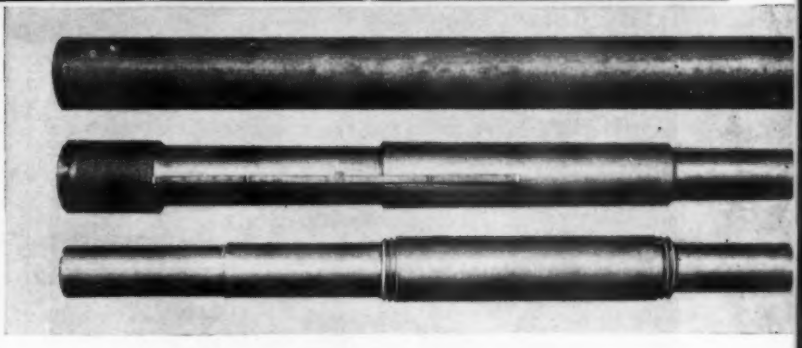
14775 WILDEMERE AVE. · DETROIT 21, MICH.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE *Lo-swing* PEOPLE"** SENECA FALLS, NEW YORK



SHAFT TURNING COSTS REDUCED ON SHORT & MEDIUM LOT PRODUCTION



Problem: To reduce the cost of turning heavy electric motor shafts on small and medium lot production.

Solution: An 8" ***Lo-swing*** Lathe was selected for this job due to the simplicity of standardized tooling which may be readily changed for different diameters and shoulder lengths, thus minimizing the time required for changing over from one type of motor shaft to another.

The motor shafts are machined in two operations, both of which are shown in the small illustration. The first operation consists of rough turning the shaft to grinding size over practically its full length. The second operation completes the turning of the pulley end, the facing of the shoulders and the cutting of the oil slinger grooves. Tooling used for this latter operation is shown in main illustration.

The broad experience of Seneca Falls engineers is available to assist you with *your* turning problems. Catalog No. HLB42 provides information on the Seneca Falls ***Lo-swing*** line. Write for a copy.

LATHE NEWS from SENECA FALLS

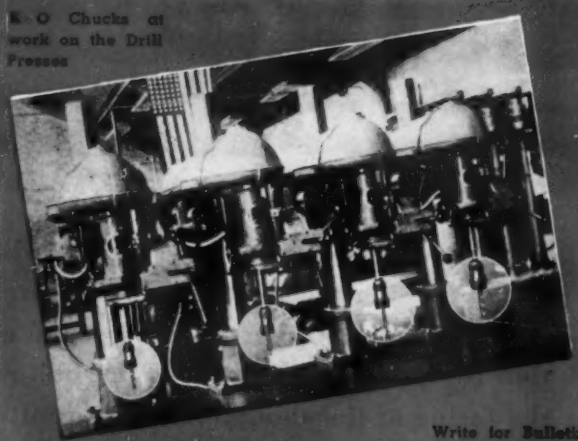
Knock-Out DRILL CHUCKS

KEYLESS SELF-ENERGIZING

● ALL Drill Chucks hold drills. But THERE IS A DIFFERENCE! K-O Chucks are built with specially heat treated, floating jaws which are your insurance for drill alignment and your guarantee against drill shank chewing. A twist of the finger tips is all that is necessary to tighten and hold the drill. From then on K-O Chucks tighten themselves. Another twist of the finger tips and the drill is released.

Made in five sizes to accommodate drills ranging in size from 0—7/8".

K-O Chucks at work on the Drill Presses



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KNOCK-OUT

K. O. LEE CO.

Aberdeen, South Dakota

Salt Brings Back That Will To Work

Heat-Fag is an ever-lurking enemy in every shop where toil and sweat are writing new production records. Body salt lost by sweating must be replaced or Heat-Fag sets in. Lowered vitality, fatigue, production slowdowns, accidents and absenteeism can often be laid at the door of this insidious force.

The finger of Accidents is always beckoning to the fatigued, inalert worker. That's why Heat-Fag, ever present when men sweat, takes such a heavy toll in man-hours lost.

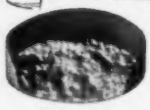
Salt tablets restore the body salt lost through sweating. They help keep men alert . . . efficient.

In leading industrial plants, salt tablets are a "must" for men who sweat. They maintain the will to work through long, hard, hot hours.

This Is What Happens When Sweating Robs the Body of Salt . . .

MORTON'S Heat-Fag SALT TABLETS

QUICK DISSOLVING (Less than 30 seconds)
This is how a Morton Salt Tablet looks when magnified. Examine one — see how soft and porous it is inside. When swallowed whole — with a drink of water, they dissolve in less than 30 seconds.
Case of 9000, 10-grain Salt Tablets, $2.60
Salt-Dextrose Tablets case of 9000, $3.15



Place MORTON'S DISPENSERS at all Drinking Fountains
They deliver salt tablets, one at a time, quickly, cleanly—without waste. Sanitary, easily filled, durable.
500 Tablet size - - $3.25 1000 Tablet size - $4.00
Order from your distributor or directly from this advertisement . . . Write for free folder.

MORTON SALT COMPANY • CHICAGO, ILLINOIS

For quickest deliveries of the supplies you need

Dial the I S D First!

Your Industrial Supply Distributor is alert to your needs and interests, every hour of the day.

He knows the many kinds of materials you must have to keep going. He tries to keep you supplied from his many available sources.

He buys on priority—he buys as often as he can—he buys as much as he can get—to cover you and his other customers. Sometimes he doesn't even notify you until the goods are in, or on the way.

Think of your Industrial Supply Distributor as your No. 1 Source. Check with him before you run short. Make it standard practice to telephone your Industrial Supply Distributor *first.*

Know him? *Of course* we do—hundreds of "him" in big and little Industrial Cities all over America have distributed Cle-Forge High-Speed Drills and Peerless High-Speed Reamers for years and years—to *their* satisfaction, and *ours!*

ARMY NAVY

ARMY E NAVY

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

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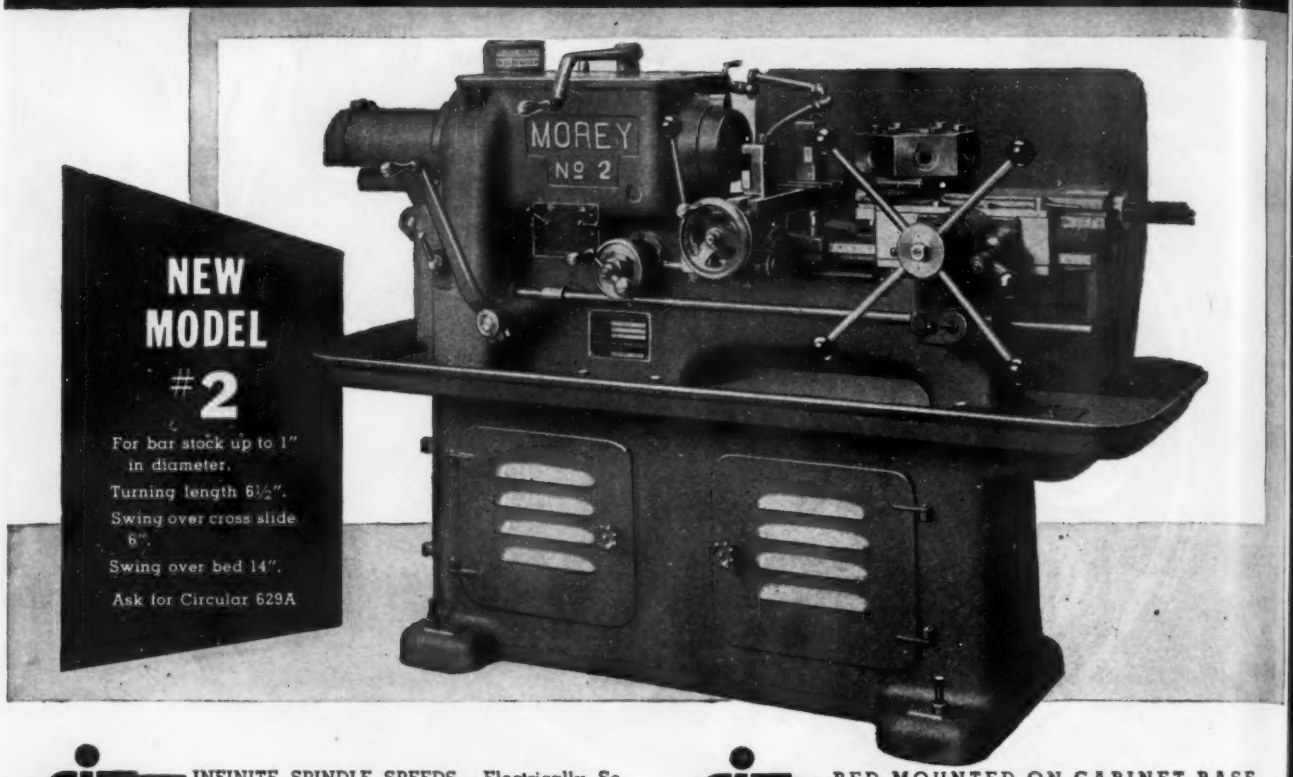
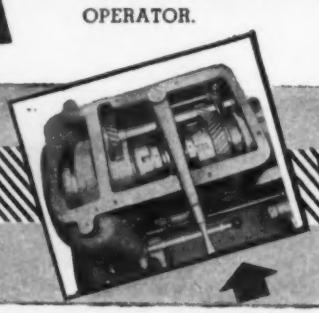
MOREY TURRET LATHES



NEW MODEL #2

For bar stock up to 1" in diameter.
Turning length 6½".
Swing over cross slide 6".
Swing over bed 14".
Ask for Circular 629A

- INFINITE SPINDLE SPEEDS – Electrically Selected—Minimum of 60 RPM. Maximum of 2000 RPM. Constant horsepower at all speeds.
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.
- BED MOUNTED ON CABINET BASE
- MOTORS AND STARTING EQUIPMENT EASILY ACCESSIBLE.
- HEXAGON TURRET AUTOMATICALLY UNCLAMPED, INDEXED AND CLAMPED.
- THREE TYPES OF CROSS SLIDES AVAILABLE: Lever Feed, Screw Feed, Combination Feed*
- *Combination feed provides instantaneous selection to either lever or screw feed.
- EIGHT (8) FEED CHANGES FOR THE UNIVERSAL CARRIAGE and HEXAGON TURRET, INSTANTLY ENGAGED OR DISENGAGED BY ONE MOVEMENT OF THE LEVER.

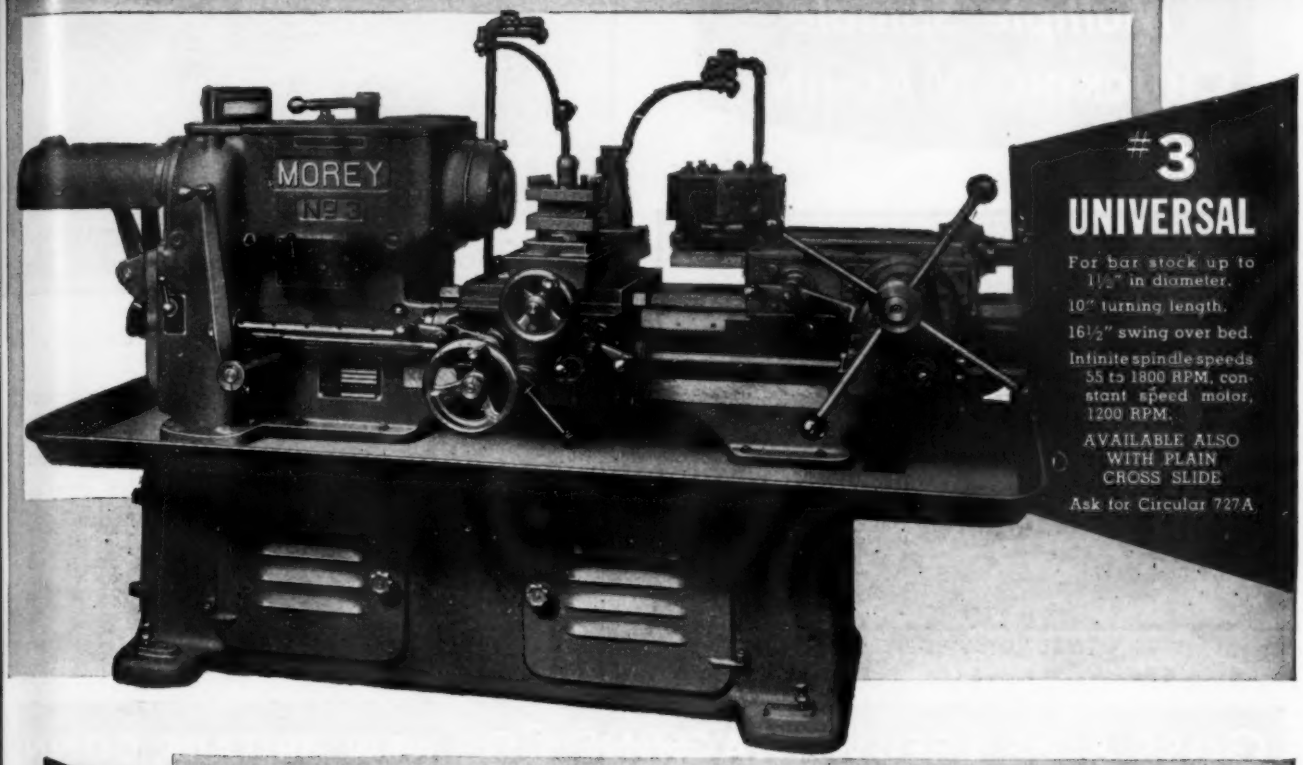


"EARLY DELIVERY"

MOREY

410 BROOME STREET

for BAR or CHUCKING { UNIVERSAL and PLAIN



#3 UNIVERSAL

For bar stock up to 1½" in diameter.

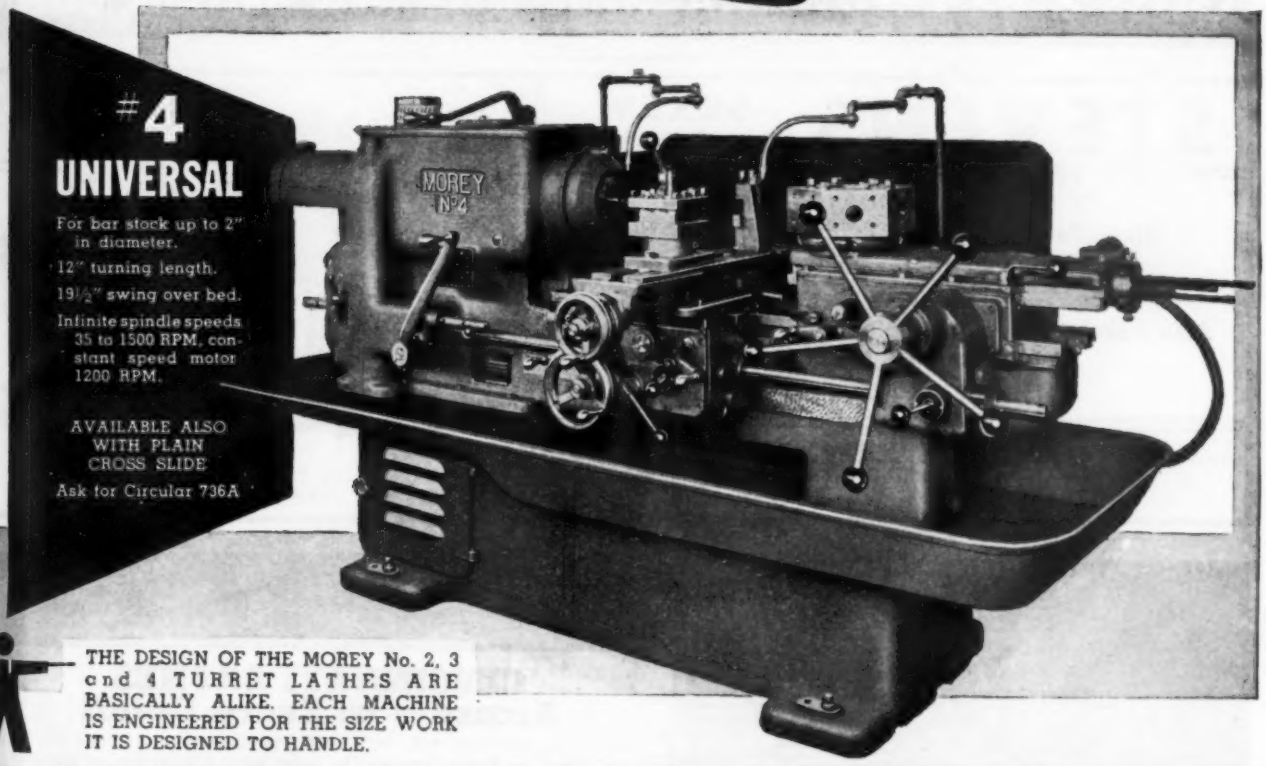
10" turning length.

16½" swing over bed.

Infinite spindle speeds 55 to 1800 RPM, constant speed motor, 1200 RPM.

AVAILABLE ALSO WITH PLAIN CROSS SLIDE

Ask for Circular 727A



#4 UNIVERSAL

For bar stock up to 2" in diameter.

12" turning length.

19½" swing over bed.

Infinite spindle speeds 35 to 1500 RPM, constant speed motor 1200 RPM.

AVAILABLE ALSO WITH PLAIN CROSS SLIDE

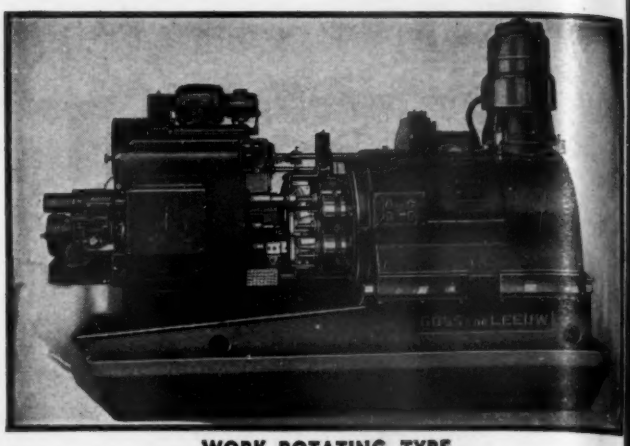
Ask for Circular 736A

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

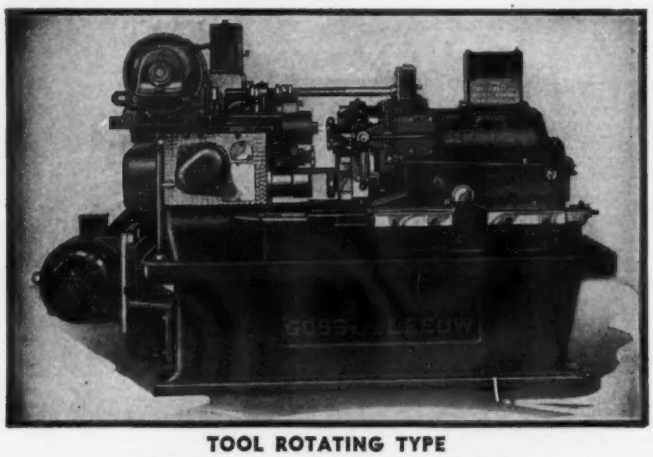
MACHINERY CO., INC

NEW YORK, N. Y. *Plant* 4-57 26TH AVE., ASTORIA • NEW YORK

GOSS & DE LEEUW
Multiple Spindle
CHUCKING MACHINES



WORK ROTATING TYPE
5 Spindles • 6 Spindles • 8 Spindles



TOOL ROTATING TYPE
4 Spindles • 5 Chucking Positions

Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

The many modern features offered in these machines are fully described in catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

STEVENS SCREW MACHINES

⅝ in. and 1⅛ in. Bar Capacities.
Simplified and Highly Efficient Motor Drive.
Write for bulletin.

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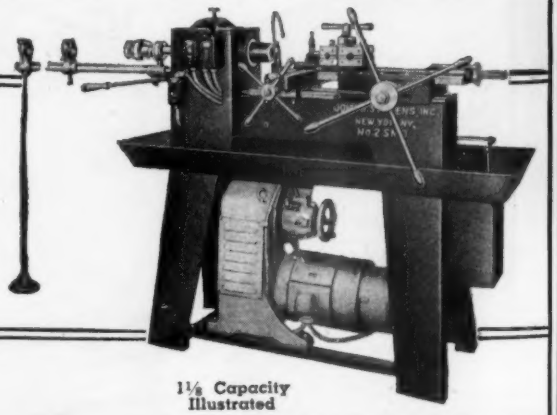
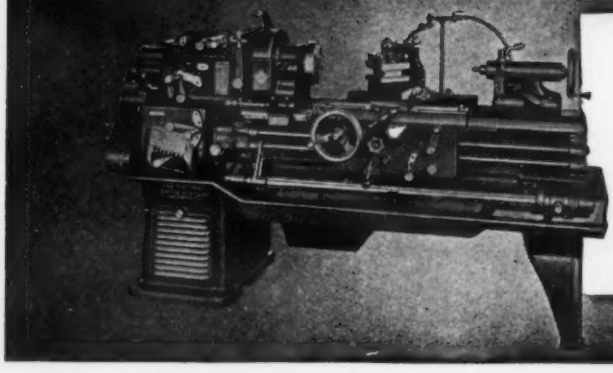
Also makers of Multiple Spindle Index Centers, Rotary Tables, Milling Machine Vises.
THIRTY YEARS' EXPERIENCE



1⅛ Capacity Illustrated

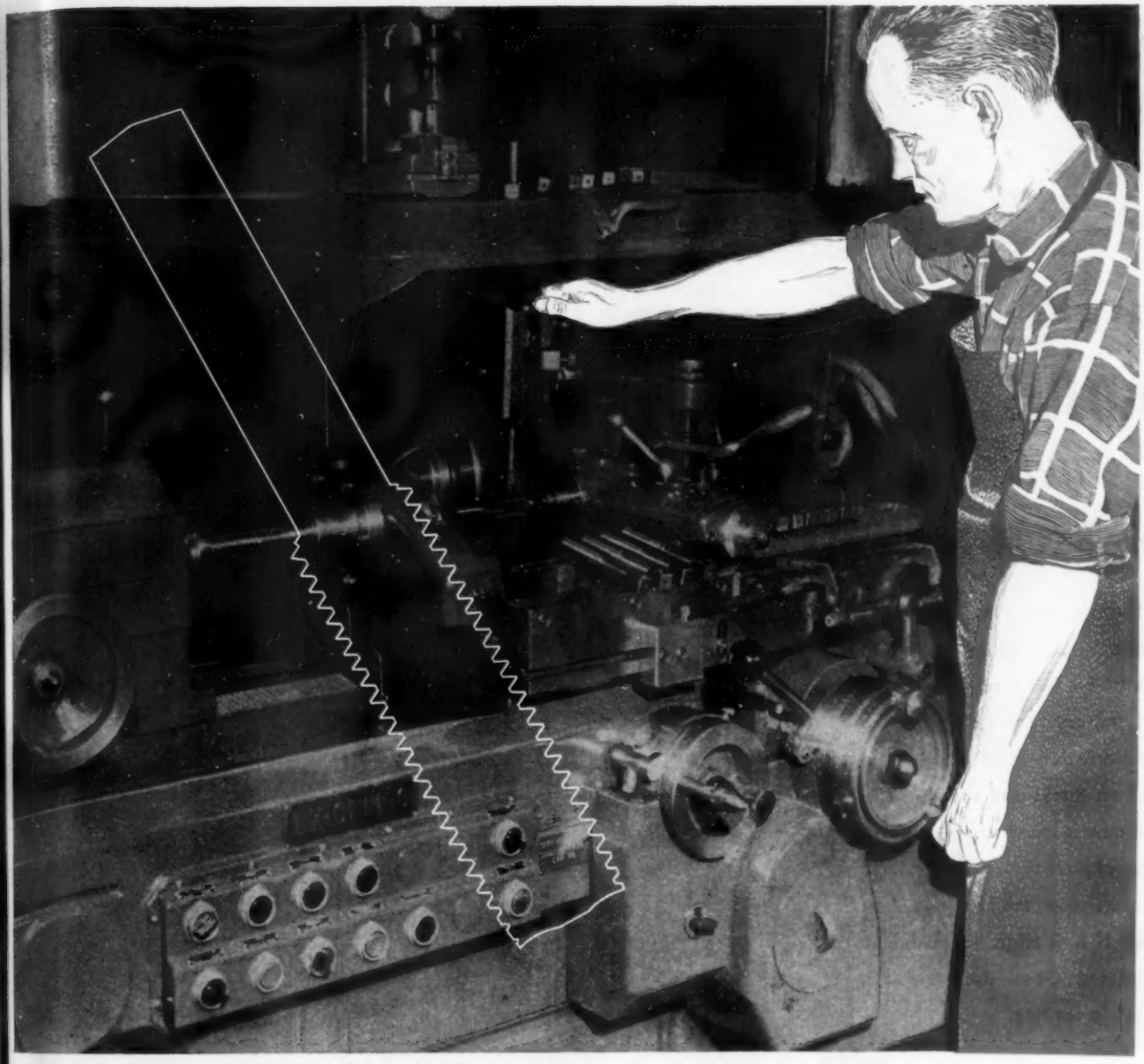
JOHN B. STEVENS INC.
474 Canal St., New York, N. Y.



CINCINNATI LATHES
Accurate in Every Detail

Gears — precision cut, tempered and ground . . . Spindle — mounted on Roller Bearings to resist any combination of thrusts . . . Bed—extra heavy in construction . . . Ways and carriage hand scraped to a precision bearing. These features of Cincinnati Lathes add up to accuracy in every detail that insures precision results on every job. Write for complete specifications on 14" to 30" sizes to produce your work always most economically.

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio



A COMBINATION HARD TO BEAT!

The right steel — the most modern machines — and skilled craftsmen — those are the ingredients of superlative tap-making. At Threadwell, the steel is metallurgically correct. The machines are the most modern that money can buy. (The Ex-Cello thread grinder in the photo is a good example). And at Threadwell the men have tap-making skill that is a heritage of generations of threading tool craftsmen. Your "Threadwell" distributor will give personal attention to your tap needs.

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Threadwell
"TAPS OF DISTINCTION"

THREADWELL TAP & DIE CO., GREENFIELD, MASS., U. S. A., FOUNDED 1902

ANNOUNCING

A NEW SERIES of Style SAML

H&G

SOLID ADJUSTABLE DIE HEADS

with Insert Chasers

for **BROWN & SHARPE** *Automatics*

Made in five sizes for B & S automatic screw machines, numbers 00, 0 and 2. A new alignment feature takes care of variation in alignment between turret and spindle. The holder is now made an integral part of the head. These Heads use the famous low cost H & G High Speed Insert Chasers. Good deliveries on high priorities.

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● *Contains detailed information and specifications you will need.*

The Eastern Machine Screw Corp.

MANUFACTURERS OF H & G DIE HEADS SINCE 1914

20 - 40 Barclay Street — New Haven, Conn.

IDEAL IS THE *Speedy Way*

TO BOOST PRODUCTION TO *NEW HEIGHTS*

LIVE CENTERS

Permit heavier loads and deeper cuts at higher speeds

Turn out MORE work in LESS time—on lathes, millers, grinders because they permit these machines to be run at full capacity. Radial load carried by high precision ball bearings; thrust load by taper roller bearing.

"TRIPLE-DUTY"

Save set-up time. 3 interchangeable inserts for all centered and uncentered work.

IDEAL METAL ETCHER

14 heats

Permanently marks all Iron, Steel and their Alloys

New all-purpose Etcher for electrically marking important information on smooth-surfaced parts, tools, dies, gages, etc. 14 heats; 115 to 1300 watts, to meet all etching requirements. Etches legibly, easily, permanently, regardless of the hardness of the tool or the part. Heat-indicating lamp brightens as heat increases. Convenient ground clamp for etching large, heavy parts and castings.

MOST COMPLETE LINE ON THE MARKET

IDEAL "3 IN 1" JUMBO ELECTRIC CLEANERS

Increase Machine Life.

Prevent Shutdowns and make the machines and motors you have last longer—perform better—by keeping them clean with IDEAL "3 in 1" JUMBO Electric Cleaner. *Blows — Vacuums — Sprays.* Super-powered 1 H.P. Motor. Air velocity 24,200 ft. per minute. Removes all dirt from hard-to-get-at places.

FREE

Machine Tool Accessories Catalog Tells you all about these and other Production Speeders — Demagnetizers, Marking tools, Balancing Ways, etc. Send for your copy today!

IDEAL *Sycamore*

★ IDEAL COMMUTATOR DRESSER CO ★

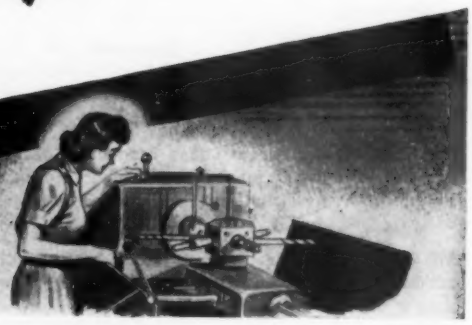
1057 Park Avenue — **Sycamore, Illinois**

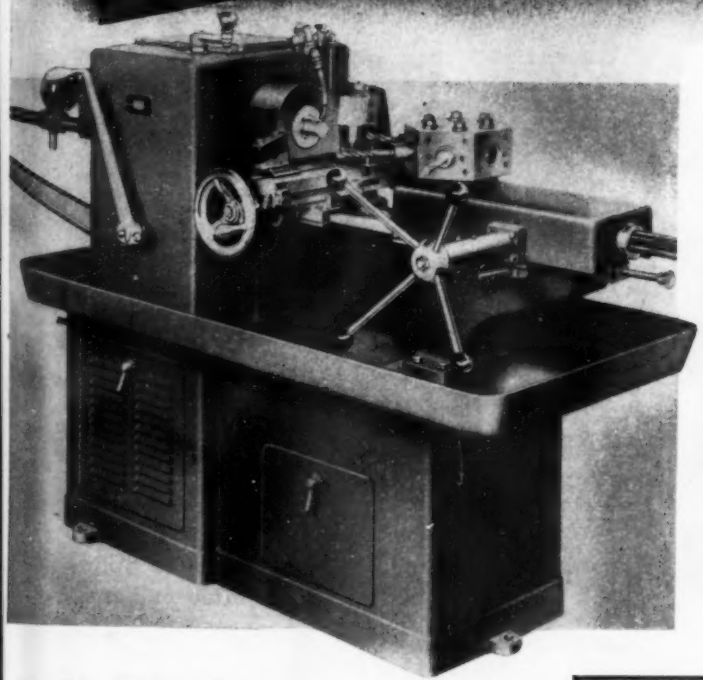
SALES OFFICES IN ALL PRINCIPAL CITIES

SIMPLICITY

of the Oster No. 601 RAPIDUCTION LATHE

Speeds Training of New Operators





Certainly you can't turn new operators loose on complicated machines. But you CAN relieve the pressure on their highly trained operators by diverting a wide variety of small diameter bar and chucking jobs to Oster No. 601 "RAPIDUCTION" Lathes.

This SIMPLIFIED machine is easy for the beginner to understand and operate efficiently after a short training period.

Ample proof of that statement is available. For example, one manufacturer has 139 Oster No. 601 Lathes operated mostly by people without prior machine shop experience.

For quick response to your request for complete details on the Oster No. 601 "RAPIDUCTION" Lathe, use convenient form below*.

No Time Out to Celebrate Our 50th Anniversary 1893-1943

OSTER

THE OSTER MFG. CO., 2049 E. 61st ST., CLEVELAND, OHIO, U. S. A.

*O. K. Oster. We're interested in the No. 601 machine. ☐ Send Catalog No. 601. ☐ Ask your nearest distributor to see us at once. (Check either or both of above requests.)

NAME_____

ADDRESS_____

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Broach & Gage Company

1008 Franklin St.,
Detroit, Michigan

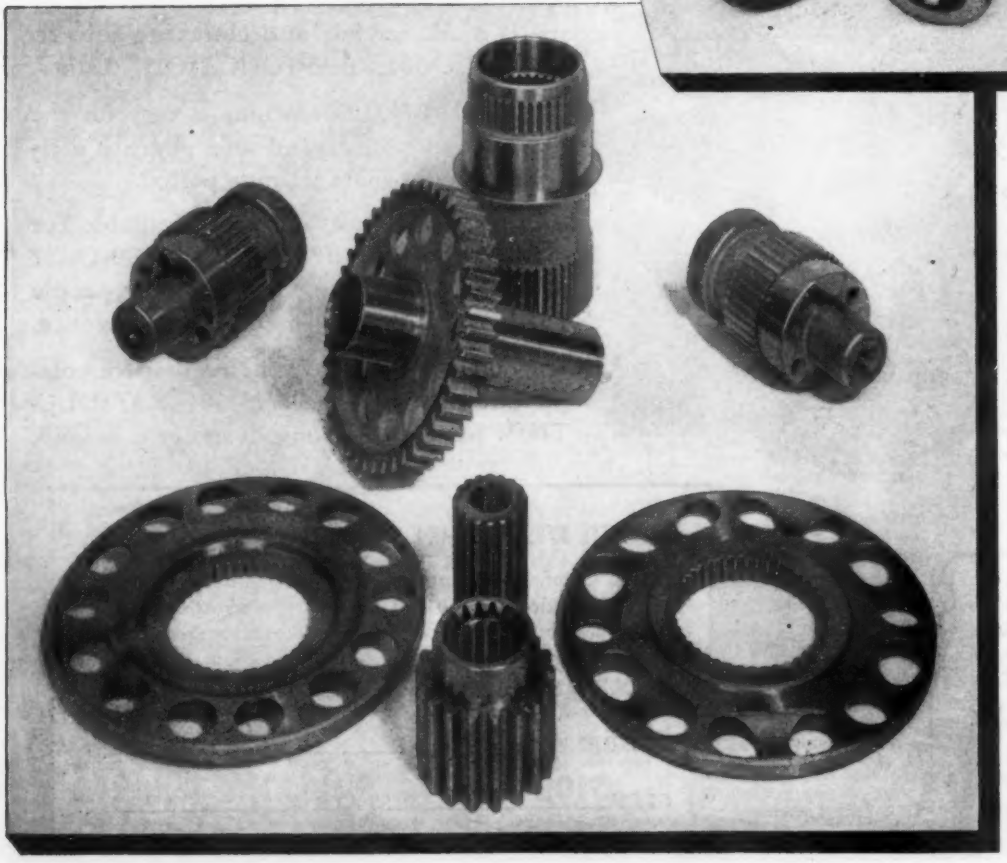
BROACHES . . still a product unknown to many which has achieved amazing records in production.

Aircraft manufacture . . . . America's No. 1 industry today . . . making the best in planes, ships, guns and instruments . . . setting a new pace for fast and precision production.

And right in step, Great Lakes Broaches establish new standards for cutting tougher metals faster, with precision and perfection never before attained.

All our products, recognized in aircraft and armament production, will meet the challenge of new and finer "tooling up" for post-war production.

We are available today to help you solve your present war production problems, or for post-war planning.



BROACHES
All types and sizes.

GAGES
Serration,
Straight and
Involute Spline,
Male or Female.

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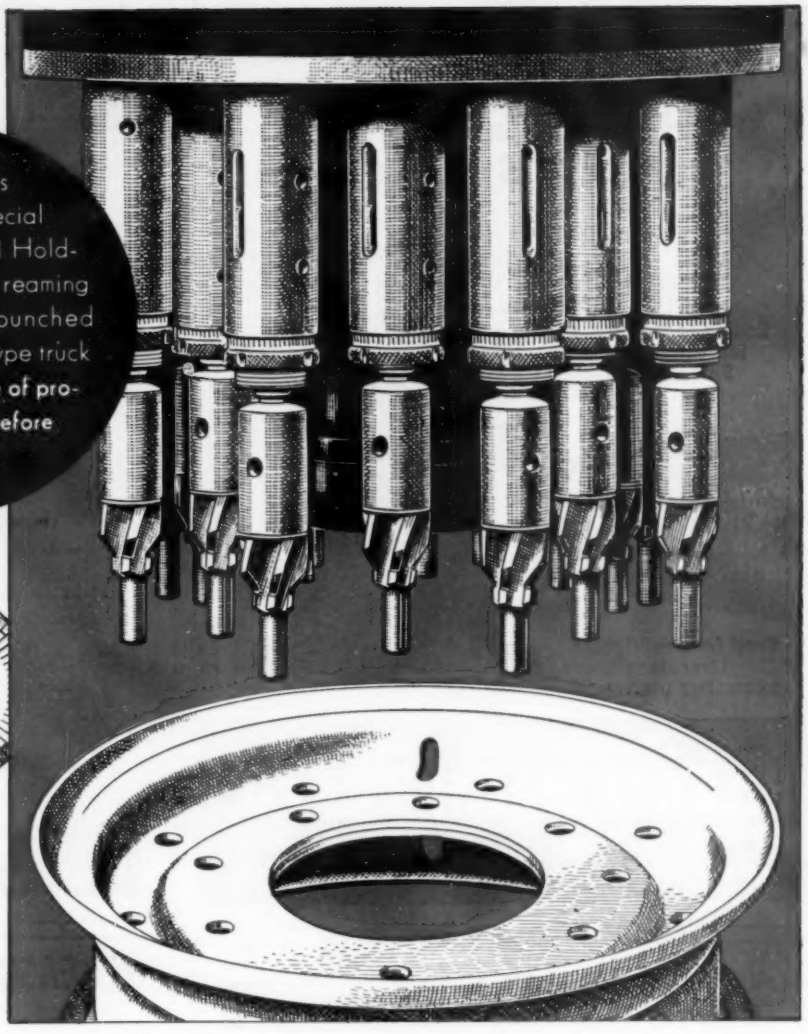
MASTER GEARS and MASTER INDEX PLATES

B&G Co.



16 spindles of Gairing Special Cutting Tools and Holders, simultaneously reaming and chamfering punched bolt holes in split type truck wheels – **at a rate of production never before equalled.**

ARMIES ON WHEELS

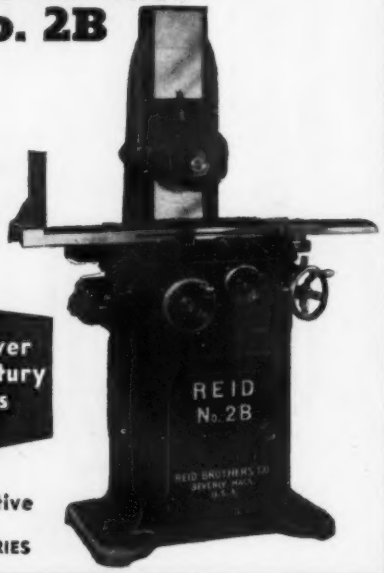
When the Automotive Industry rolled up its sleeves and went to war, it was given an assignment the results of which will rate high in modern military and industrial history. For the war vehicles it is producing has made a reality of a military necessity – Armies on Wheels: trucks, tanks, half-tracks, jeeps, et cetera – thousands and thousands and thousands of them. Yes, the Automotive Industry has gone to war for its Uncle Sam – **enlisted for the duration.** And Gairing, as in the past, continues to pass the ammunition – continues to supply the industry with the fine cutting tools necessary for the precision production of the parts with which war vehicles are made.

THE GAIRING TOOL COMPANY, Detroit, Michigan

Manufacturers of Standard,
Special and Gair-Lock
Inserted Blade Cutting Tools

GAIRING
FOR OVER A QUARTER CENTURY
SPECIALISTS
IN FINE
CUTTING TOOLS

REID All Electric
Automatic Feed Surface Grinder
No. 2B



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EXCELLENT DELIVERIES

Exclusive Selling Agents
H. LEACH MACHINERY CO.
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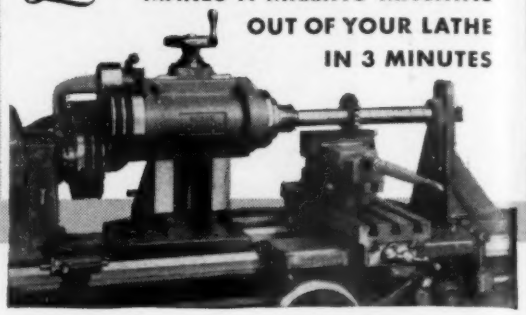
GLOBE MILLER

Quickly earns its cost!

MAKES A MILLING MACHINE OUT OF YOUR LATHE IN 3 MINUTES



Attaches to your lathe, does same precision work as a costly milling machine. Increases swing of lathe 5 to 10 inches, depending on lathe size. Complete line of accessories available, such as Dividing Heads, Vises, Work Holding Fixtures, Arbors, End Mill Holders. Write today for descriptive folder.

GLOBE PRODUCTS MFG. CO.
3382 Robertson Boulevard Los Angeles, California

Don't Overlook This Possibility for Increased Production

★ ★ ★

Equip your shop with these economy tools for holding work while being machined. Hardened tool steel—precision ground.

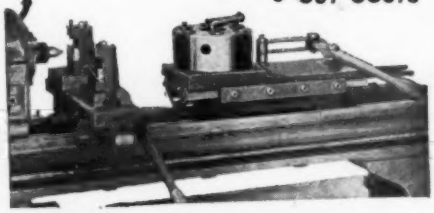
NICHOLSON *Expanding*
MANDRELS
Save Time
Improve Shop Efficiency

Two types. All sizes. Sold singly or in sets. Prompt delivery. Bulletin No. 741.

W. H. NICHOLSON & CO.
114 OREGON ST., WILKES-BARRE, PA.
Other Products: Arbor Presses—Control Valves—Steam Traps—Etc.

INCREASE THE EARNING POWER OF YOUR ENGINE LATHES WITH

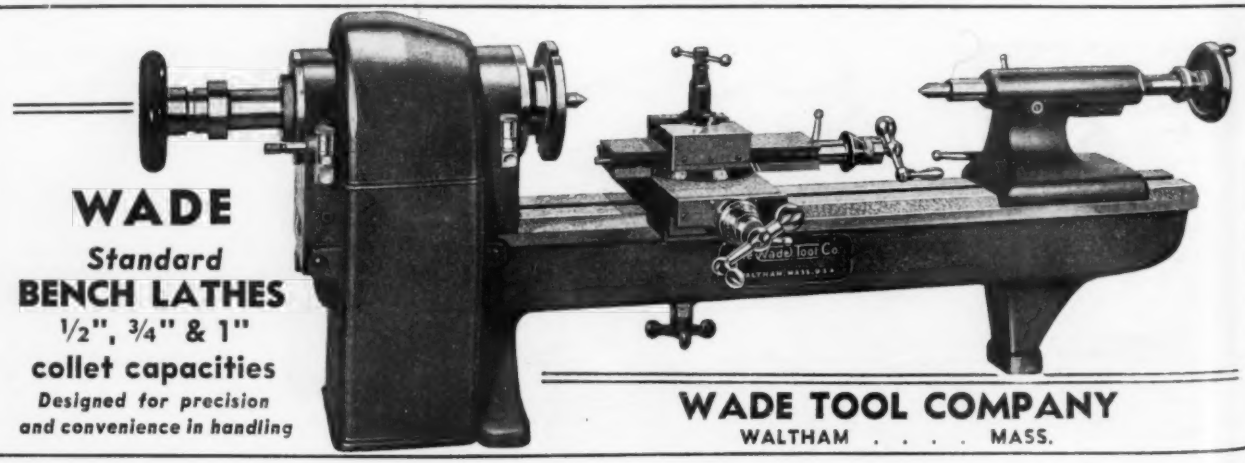
SAVE TIME • SPEED PRODUCTION • CUT COSTS



HEAVY DUTY Self-Indexing BED TURRETS

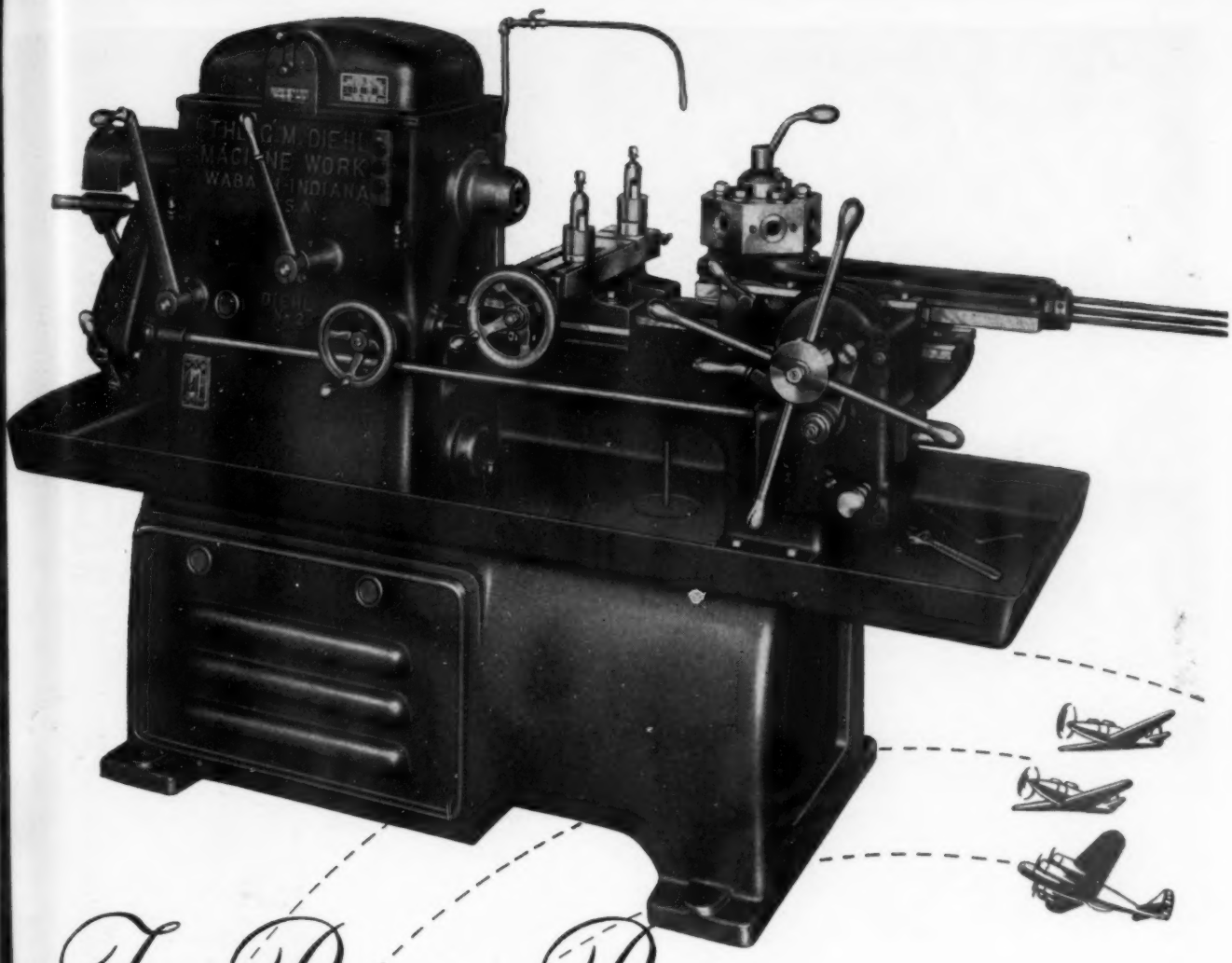
Complete unit with cutoff cross slide and tool posts designed for Logan, South Bend, Atlas and similar types of bench lathes.

HANDLES SCREW-MACHINE WORK
Ask Your Jobber or Write for Circular
LYNN MANUFACTURING CO., 219 Elroy Street, Minneapolis, Minn.



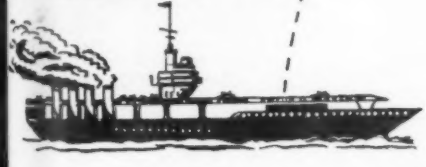
WADE
Standard
BENCH LATHES
1/2", 3/4" & 1"
collet capacities
Designed for precision and convenience in handling

WADE TOOL COMPANY
WALTHAM . . . . MASS.



For Precision Production

Plants engaged in the manufacture of vital war equipment find the Diehl Turret Lathe, embodying the most advanced developments, unsurpassed for sustained, high speed, precision performance. Works alongside any other No. 2 lathe of standard make, using same tooling, including collets. Automatic chuck capacity (round) —1″ . . . swing-over cross slide, 6″ . . . over bed, 14″. Six speeds, forward and reverse. Write for complete specifications and illustrated brochure.

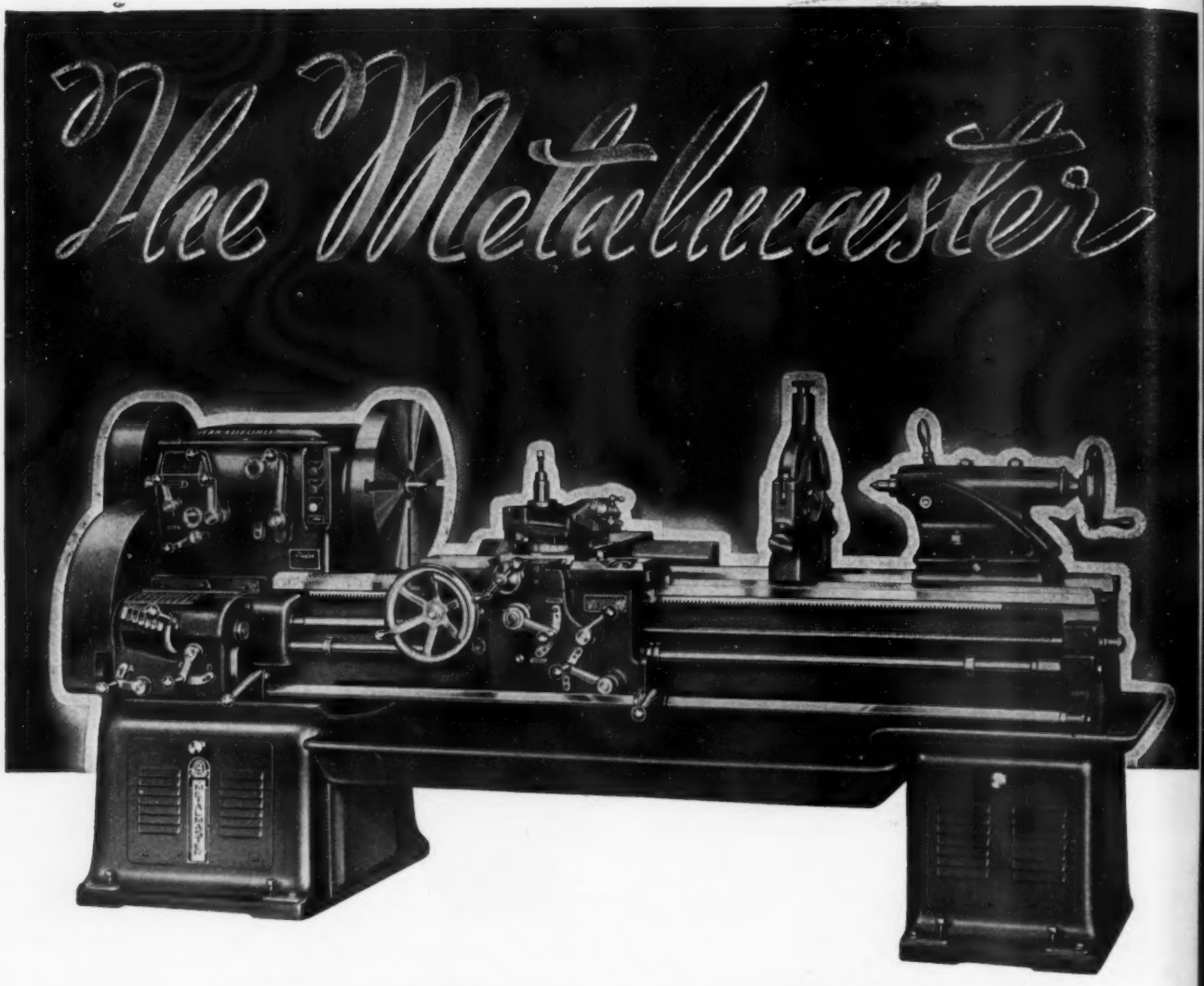


The G. M. DIEHL *Machine Works.*

WABASH, INDIANA

Where precision craftsmanship is honored ★ ★

The Metalmaster



. . . Geared for Production!

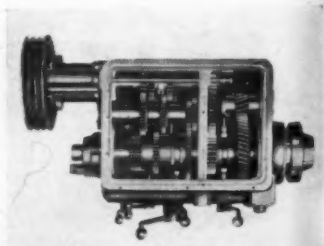
For fast, precision-production, plus ease and economy of operation . . . look to the METALMASTER!

These points assure superior performance:

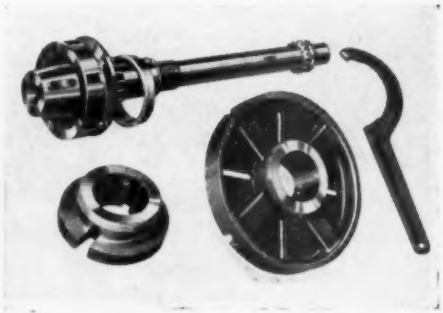
HEADSTOCK—Heavy walls, sturdy center bracing, twelve spindle speeds, both forward and reverse, alloy steel gears, conveniently located shift handles.

SPINDLE—Machined from solid high-carbon molybdenum steel forgings, bored straight through. Large precision-tapered roller bearings. Chuck and face plates are drawn back securely by a locking ring—driven by a large key.

SMOOTH, POWERFUL DRIVE—"V" belts insure quiet, efficient power delivery. Multiple disc clutch operates completely oil-immersed. Jogging, with motor running at high speed is entirely possible. Completely adjustable brake and clutch. Drive sheave is mounted on tapered roller bearings.



Solve production problems . . . specify **METALMASTER.** Write—we'll send catalogs explaining the **METALMASTER** in detail.



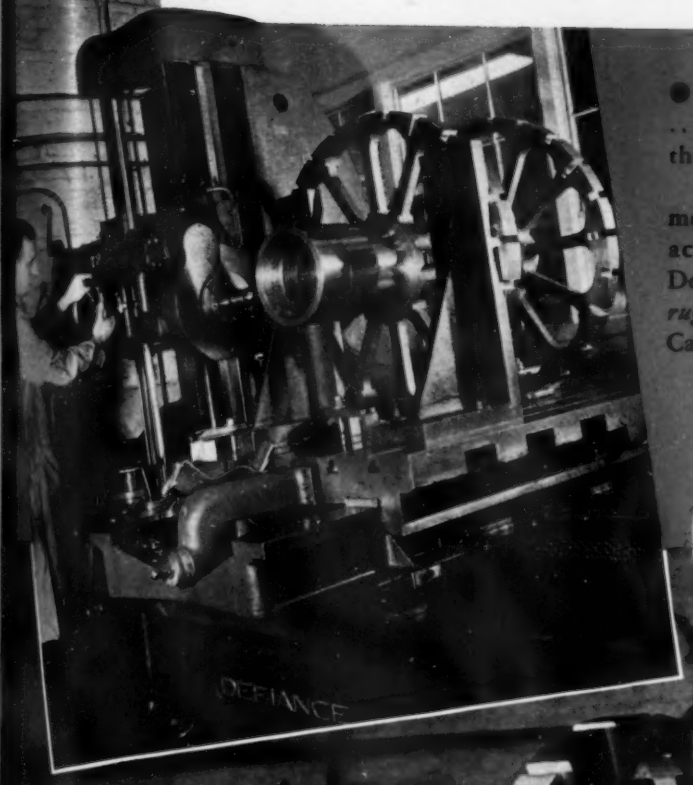
The BRADFORD MACHINE TOOL Co

MANUFACTURERS OF METAL WORKING LATHES; CAM FEED DRILLING AND TAPPING EQUIPMENT, HYDRAULIC DRILLING MACHINES . . . IN BUSINESS SINCE 1840

659 EVANS AVE. . . . CINCINNATI, OHIO

WORLD'S LARGEST HONING TOOL

machined by Defiance!

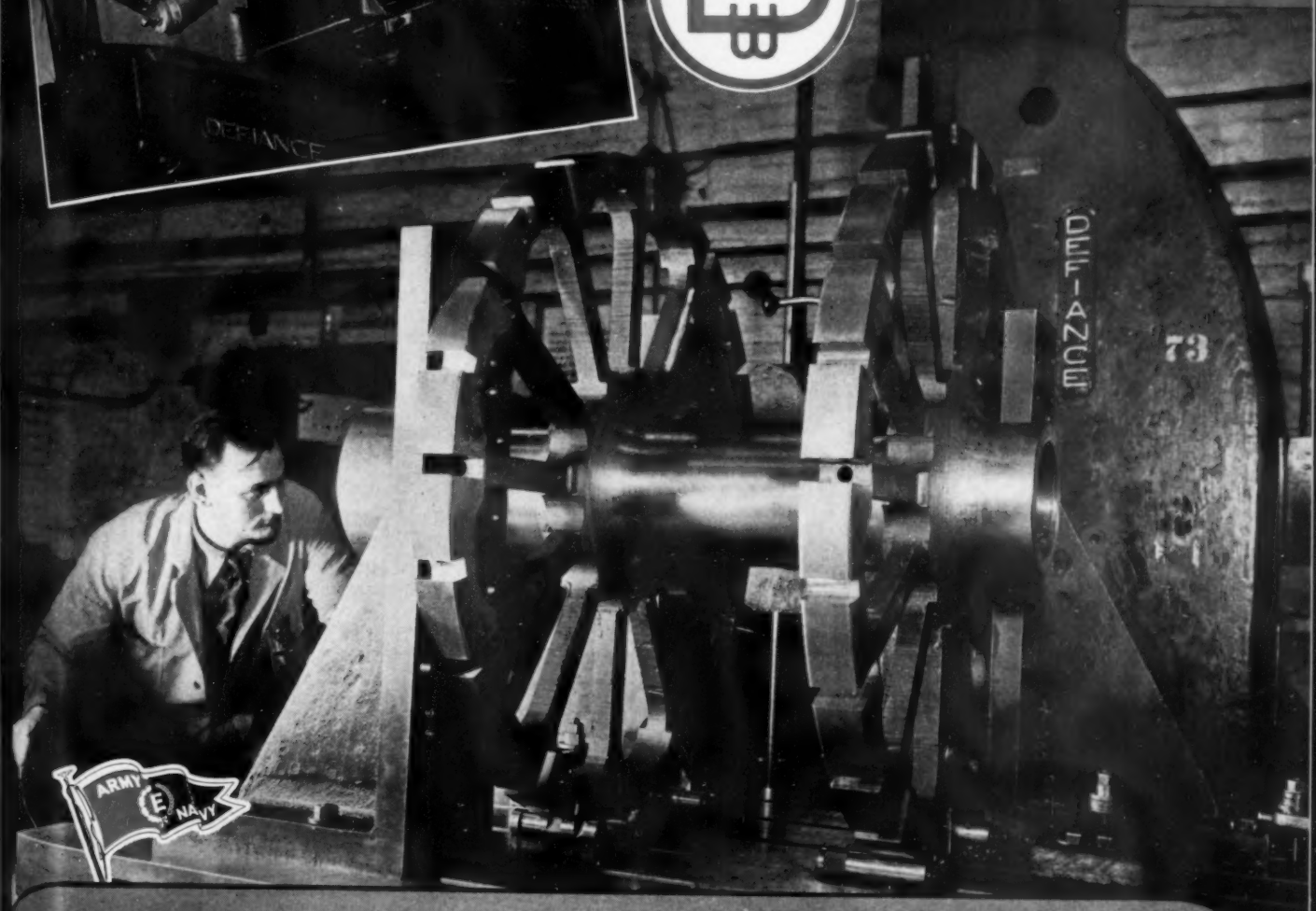


● Here's the largest honing tool ever made (41½" diameter) . . . being accurately machined on a Defiance Boring Mill at the Micromatic Hone Company, Detroit.

For tough jobs like this throughout industry today . . . more and more plants use Defiance Machines where speed, accuracy and rugged simplicity of design are essential. Defiance Engineering builds 'em *right* with utmost *precision, ruggedness, dependability!* See our insert in Sweet's Mechanical Catalog or write for latest bulletins.

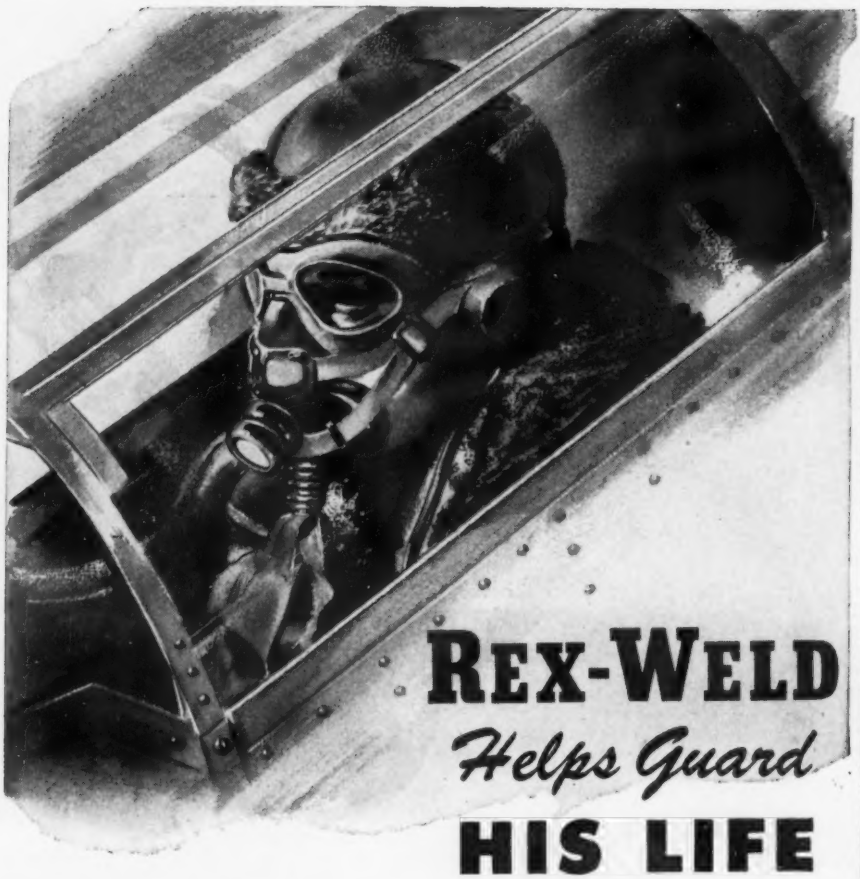
Defiance Machine Works, Inc., Defiance, Ohio

Makers of Precision Machinery Since 1850



DEFIANCE

Horizontal BORING . . MILLING . . DRILLING . . TAPPING *Machines*

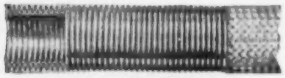


REX-WELD *Helps Guard* HIS LIFE

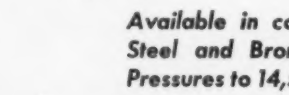
REX-WELD Flexible Metal Hose has met the critical test that demands only the best materials for our combat planes. More and more bombers, fighters and interceptor-pursuit ships are being Rex-Weld equipped.

REX-WELD's war service is not confined to the planes themselves. In the steel mills and munition factories, on the production and assembly lines, everywhere that war-worthy flexible connections are needed, REX-WELD is rendering vital service.

There are specific reasons for this. REX-WELD is a specially constructed flexible metal tubing. It is fabricated from strip metal by a precision autogenous welding process that produces uniform, stronger wall structure plus extreme flexibility. REX-WELD stands up under high pressures, high and low temperatures, extreme contraction and expansion. It is seep-proof to gas, water, oil, air and searching fluids.



Type RW-81
(annular corrugations)



Type RW-91
(helical corrugations)

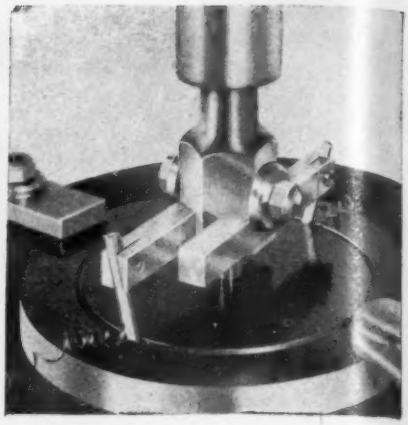
Available in continuous lengths to 50 ft. Both Steel and Bronze. 3/16" I. D. to 4" I. D. inc. Pressures to 14,500 p.s.i. Temperatures to 1000° F.

Write for Engineering Recommendations

CHICAGO METAL HOSE CORPORATION

General Offices: MAYWOOD, ILLINOIS

Factories: Maywood and Elgin, Illinois



NEW *Adjustable* FLY CUTTER

Holes or Disks 4" to 10"
One Inch Thickness Capacity
Unique Blade Arrangement
Simplified, Long Life Design

This remarkable new Clark Cutter does the work of several tools, results in substantial operating economies. PITCHED BLADES of precision-ground High Speed Steel set with 11-degree drag cut true and smooth . . . relieve chatter; make clean, long-curl chips, give longer bit life. REMOVABLE PILOTS, hardened and ground, permit use of lead drills. Only ⅛ inch work clearance required; allows deeper cuts without undue blade stress. Straight or tapered shanks. PROMPT DELIVERY on suitable priority.

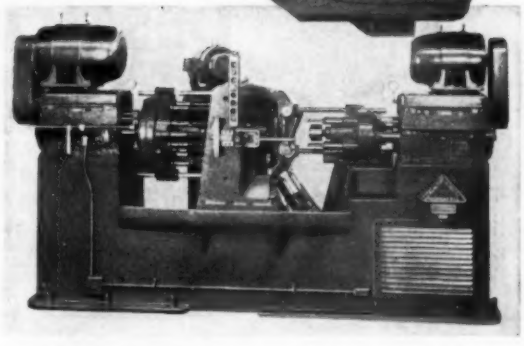
Write for Bulletin No. AM-7

Facing steel with Clark Adjustable Surface Facer.

Clark Adjustable Hole Cutters cut accurate, clean holes quickly in stainless steel, pipe, plastics, etc. Only seven sizes cover all fractional diameters ⅝" to 5" and up to 1" thickness!

Robert H. Clark Co.
3424 SUNSET BOULEVARD • LOS ANGELES, CALIF.
Manufacturers: Precision Tools, Precision Parts

Several TWIN-RAM HYDRAULIC UNITS ON ONE MACHINE CONTROLLED FROM *One Location*



SELF CONTAINED—available either right or left hand—so when several units are mounted on one base to be tied together, operation can be controlled from one location. The operator is not compelled to walk around the machine to make adjustments.

The TWIN RAM Hydraulic Unit has high salvage value, for it can be lifted from one base on which it has served its purpose, and be placed on another base to provide power for a different job. Spindle speeds can also be changed to meet desired requirements.

The distinctive electrical control makes possible rapid advance, feed, dwell, and rapid return.

The unit is made in two sizes: Model 2000, which drills up to ⅞ inch diameter in machine steel (for single drill or equivalent for multiple drilling) and Model 5000 for drilling up to 2-inch diameter (for single drill or equivalent for multiple drilling).

Send for literature giving complete information.

Installation can be provided to take care of any conditions such as:

(1) Rapid approach, feed, rapid return.

(2) Rapid approach, feed, second rapid approach, then second feed, and rapid return.

(3) Rapid approach, feed, dwell, rapid return.

BUY WAR BONDS

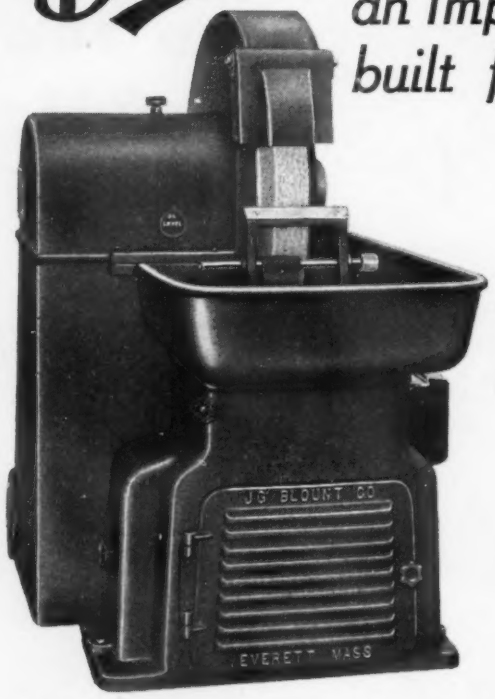
LeMaire TOOL & MFG. CO.

2665 S. TELEGRAPH ROAD ▲ DEARBORN, MICHIGAN

ENGINEERS AND BUILDERS OF PRODUCTION MACHINES

"Blount" MODEL H WET TOOL GRINDER
30 INCH

an Improved, Modernized Machine built for long, hard service . . . .



Designed for tool room or shop service this improved machine can be depended on for grinding large tools for heavy production machines. Outstanding performance is definitely assured.

Among the many features offered are:

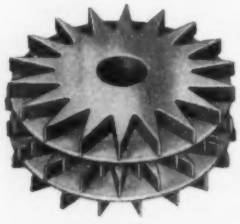
. . . Timken tapered roller bearing pillow block with constant oil flow.
. . . Combination tool rest and wheel dresser.
. . . Filter tank with removable strainer located just inside rear ventilator door. This tank filters coolant before passing through centrifugal pump. A shut off valve placed between this and main coolant reservoir provides the means of closing system before removing filter strainer for cleaning, etc.
. . . A 5 HP motor is mounted in air-flow base, for cool running and easy accessibility.
. . . Provision is made for quick wheel change.
. . . Wheel is adjustable for balance and bearings are adjustable for wear.
. . . 4-V belt motor drive is completely adjustable.

CONDENSED SPECIFICATIONS

Floor to center of spindle—38" Spindle Speed—720 R.P.M.
Pan—52" long, 26" wide, 8" deep Pump Speed—1050 R.P.M.
Dimensions of base—38½" x 30¾"

Write for descriptive literature giving complete information

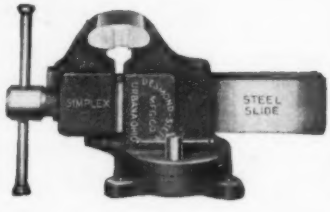
J. G. BLOUNT CO.
Everett, Mass., U. S. A.



DESMOND
GRINDING WHEEL DRESSERS & CUTTERS

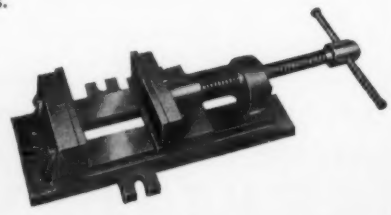
We manufacture a complete line of wheel truing tools and can supply the proper dresser for each of your grinding wheels.

SIMPLEX
Steel Slide
VISES



A full line of Machinists, Welders, Filers, Production and Drill Press & Milling Machine Vises with solid steel slides.

Write for copy of catalog "A" and name of your nearest dealer who can supply you.



THE DESMOND-STEPHAN MFG. CO.
URBANA, OHIO

TO INSTRUCT NEW MEN IN THE HANDLING OF DIAMOND TOOLS

we will send you a valuable booklet. No charge, no obligation.

KOEBEL DIAMOND TOOL CO.
9345 Grinnell Ave., Detroit

KOEBELITE DIAMOND TOOLS

Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for all Industrial Purposes.

ABRASIVE SURFACE GRINDERS

No. M3 Motorized Spindle

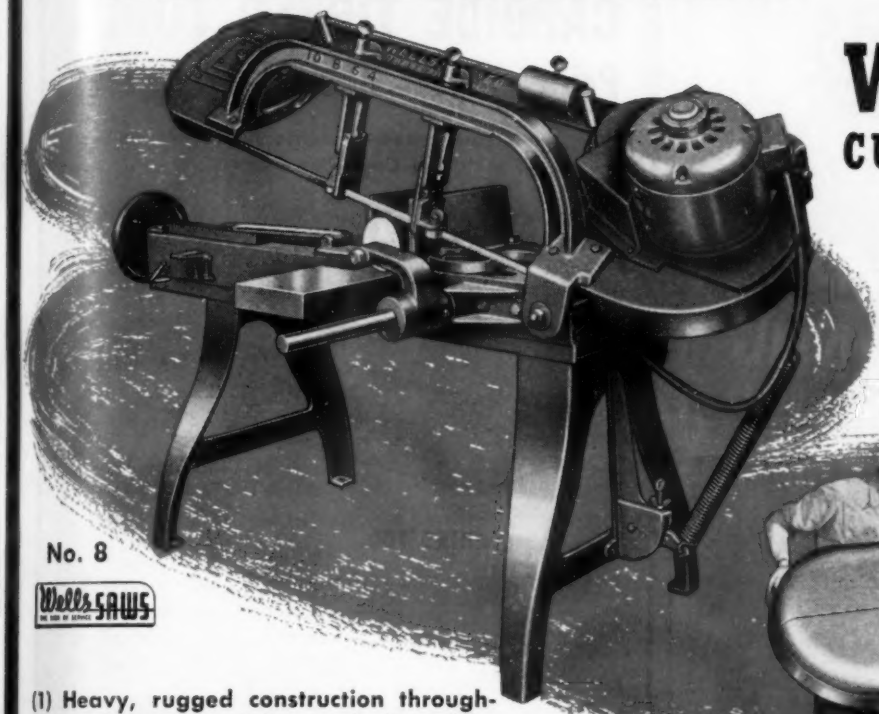
Get acquainted with the complete line of Abrasive Grinding Machines.

Information available in Sweet's Catalog, from nearest dealer or home office.

ABRASIVE MACHINE TOOL COMPANY
EAST PROVIDENCE · RHODE ISLAND

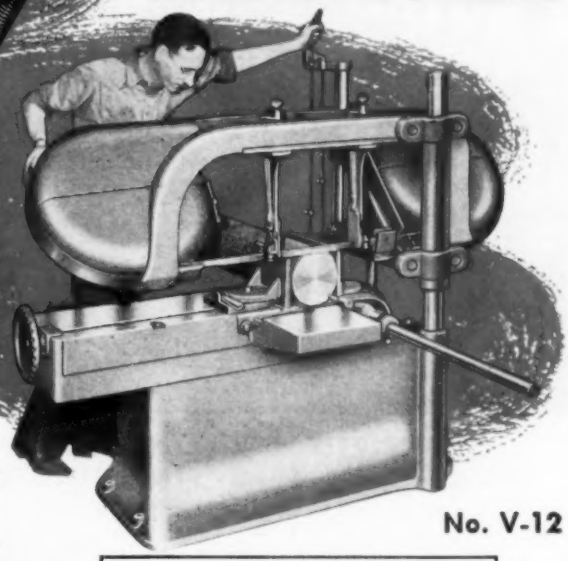
12 Reasons Why!

WELLS METAL CUTTING BAND SAWS DO THE JOB . . . BETTER FASTER ECONOMICALLY



No. 8

Wells SAWS



No. V-12

(1) Heavy, rugged construction throughout insures precision work, long life.

(2) Vibrationless operation means truer cutting, faster cutting.

(3) Guides, mounted on heavy, precision machined I beam can be moved nearly flush against work. Accuracy meets standard requirements.

(4) Will cut various metals, of many shapes, including tool steels, stainless steels, etc.

(5) Continuous cutting method assures maximum cutting speed.

(6) Because the saw blade runs cool, it can be operated at the highest speed suitable to the type of metal being cut.

(7) Speed can be regulated — 30, 90, or 130 feet per minute.

(8) Low initial cost for a metal cutting band saw having capacity and quality.

(9) A minimum of moving parts means long service at low maintenance cost.

(10) Low power consumption — 1/2, 1/3 and 3/4 h.p. motor depending on size of saw.

(11) Small floor space — only 24" x 60" for Model 8 and 30" x 73" for Model V-12.

(12) Faster cutting of Wells Metal Cutting Band Saws means fewer man-hours per job.

Ask your Mill Supply dealer to give you a Wells demonstration. No obligation, of course.

SPECIFICATIONS	
WELLS NO 8 METAL SAW	
Capacity: Rectangle	8" x 16"
(spec. bowed guides)	5" x 24"
Rounds	8" dia.
Speeds: ft. per min.	60, 90, 130
Motor	Specifications optional
WELLS NO. V-12 METAL SAW	
Capacity Rectangle	13" x 16"
Round	13" dia.
Speeds: ft. per min.	50, 90, 150
Guides	Adjustable
Feed	Hydraulic-Controlled
Vise	New quick acting type
Motor	Specifications optional

Write for your copy of the new Wells Catalog

WELLS MANUFACTURING CORPORATION

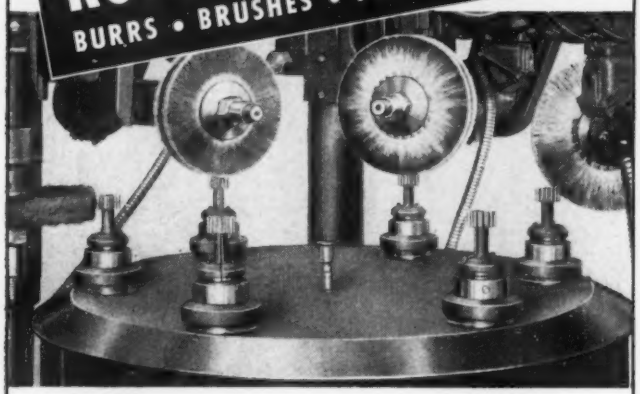
Wells METAL CUTTING BAND SAWS

505 ROOSEVELT ROAD • THREE RIVERS, MICHIGAN

Steel Pinion Gears Burred at the Rate of 150 to 200 Per Hour On a

Hammond ROTARY AUTOMATIC

BURRS • BRUSHES • POLISHES • BUFFS



ENGINEERED FOR FAST, LOW COST, QUALITY FINISHING

HAMMOND high-production 6 and 8 spindle Rotary Table Automatics are standard units engineered into a wide variety of set-ups to do burring, brushing, polishing or buffing operations on a great many items of varying sizes, shapes and kinds of metal.

Illustrated above is a typical finishing operation — the brushing of steel pinion-gears to remove the burrs and finish the edges of the teeth on the outside diameter of the gear, as well as smoothing the sides of the gear and the edge of the bore. 150 to 200 gears per hour are finished complete on both sides.

HAMMOND engineers are eager to help solve your finishing problem too — wire, phone or write today for ROTARY AUTOMATIC Bulletin No. 401.

BULLETINS AVAILABLE ON HAMMOND PRODUCTS—CHECK AND RETURN

- ☐ Chip Breaker Grinders
- ☐ Carbide Tool Grinders
- ☐ General Purpose Grinder
- ☐ Heavy Duty Grinders
- ☐ Abrasive Belt Grinders
- ☐ Rotary Automatics
- ☐ Cylindrical Polishers
- ☐ Polishing Lathes

Hammond Machinery Builders INC.

KALAMAZOO • MICHIGAN

1618 DOUGLAS AVENUE

Eastern Branch—71 West 23rd Street, New York, N. Y.

TUNGSTEN CARBIDE TIPPED TOOLS

Price $1.00 Each In Any Size

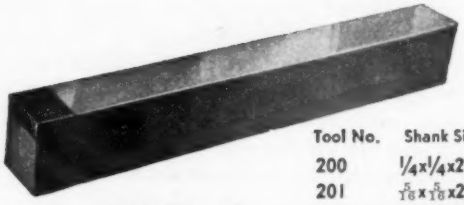
New Low Prices—Increase Production—Cut Operating Costs

Tools are tipped with Tungsten Carbide, and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials such as hard rubber, bakelite, fibre, and tough alloy steels up to 500 Brinell hardness

Left Hand-Reverse Image. Right Hand Shown

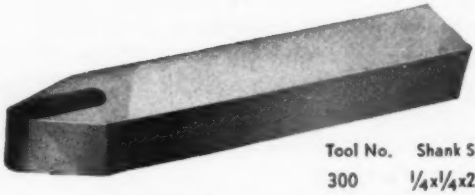
SERIES 100

Tool No. RH	LH	Shank Size
R-100	L-100	1/4x1/4x2
R-101	L-102	5/16x5/16x2 1/4
R-103	L-104	3/8x3/8x2 1/2
R-105	L-106	7/16x7/16x3
R-107	L-108	1/2x1/2x3 1/2



SERIES 200

Tool No.	Shank Size
200	1/4x1/4x2
201	5/16x5/16x2 1/4
202	3/8x3/8x2 1/2
203	7/16x7/16x3
204	1/2x1/2x3 1/2



SERIES 300

Tool No.	Shank Size
300	1/4x1/4x2
301	5/16x5/16x2 1/2
302	3/8x3/8x2 1/2
303	1/2x1/2x3 1/2

Standard Tungsten Carbide Tipped Tool Bits

In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lots of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

WE CARRY SILICON CARBIDE EMERY WHEELS FOR GRINDING TUNGSTEN CARBIDE TOOL BITS

Send for our latest circulars

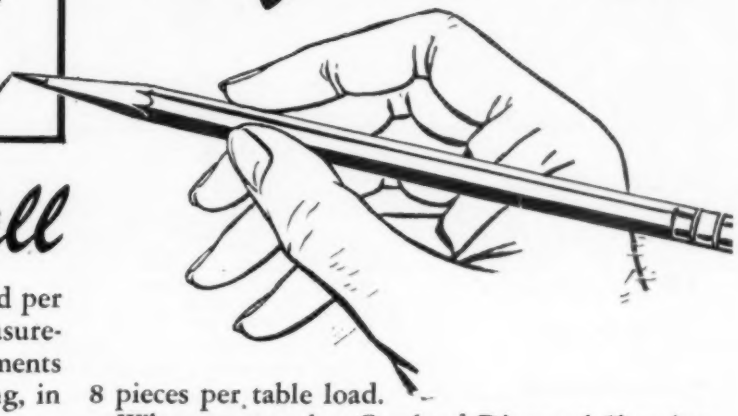
VICTOR MACHINERY EXCHANGE, Inc.

251 CENTER STREET NEW YORK, N. Y.

PRODUCTION TEST

	Brand Formerly Used	Cortland
Cubic inches of stock removed per inch in height of segments	180	300 ✓
Ampere Readings	55 to 60	55 to 60
Dressings Necessary	1	None ✓
Work Heat?	No	No
Grinding Time	7 min.	3½ min. ✓

Done in half the time



but that's not all

Check the (✓) cubic inches of stock removed per inch in height of segments. This work measurement factor shows Cortland Chuck and Segments did 66.6% more work, with (✓) no dressing, in (✓) half the time.

This Production Test Run was made on a Blanchard No. 18 Vertical Surface Grinder: wheel speed 705 R.P.M. Work consisted of side plates for 30 cal. Machine Gun: 52.5 sq. in. per piece, 8 pieces per table load.

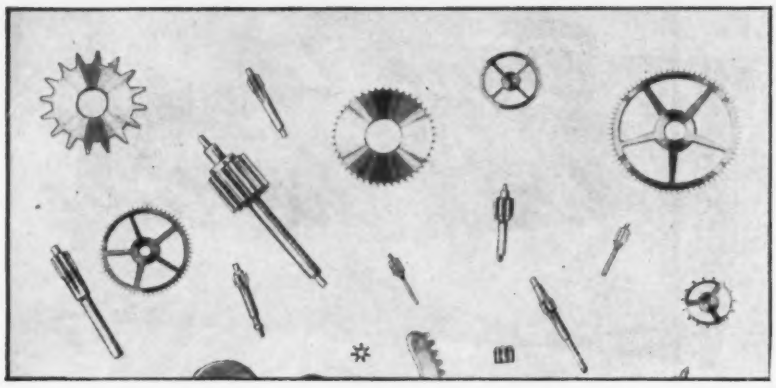
Why not see what Cortland Diagonal Shearing can do to improve production in your plant? Send for the Cortland Segmental Chuck bulletin—and information on Cortland Grinding Wheels of all types.

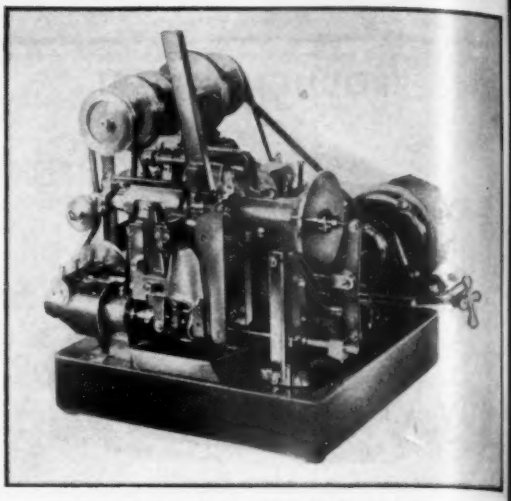
DIAGONAL SHEARING
Shock and resistance minimized as narrow end of segment starts grinding action. Large surface still exposed to coolant. Diagonal motion of straight inner edge of segment produces powerful shearing action. Increasing contact combines rapid stock removal with minimum heating.
Maximum area of segment in contact with work momentarily. As segment continues to pass across work, grinding area becomes smaller, with more surface exposed to coolant.

CORTLAND *Segmental Chucks*

CORTLAND GRINDING WHEELS CORP. • CHESTER, MASS.

WALTHAM PINION AND GEAR CUTTERS





Cut small, fine pitch parts in quantity to closest precision . . .

These machines—available in single-cut, multiple-cut and magazine-fed types—assure tool room standards of accuracy in cutting such parts as the typical cones shown here. These small parts—for use in watches, instruments, time fuses, etc.—can be produced easily, quickly and conveniently on Waltham machines without skilled help. Only straight teeth can be cut.

Waltham offers these machines for either countershaft or individual motor drive.

Write for complete, detailed specifications

TYPES OF MACHINES

SINGLE CUT PINION MACHINES
Only one cutter employed. Blank is positioned and machine started by hand; other movements are automatic.

MULTIPLE-CUT PINION MACHINES
Used for second or third cut; employ two or three cutters.

MAGAZINE-FED PINION MACHINES
Fully automatic (except for loading); used for continuous production of one kind of pinion.

GEAR CUTTING MACHINES
In single and multiple-cut types for cutting teeth on gears up to 1½" pitch diameter.

WALTHAM MACHINE WORKS

WALTHAM MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

DIAMONDS for Victory

BIG-HED-NIBS
LOC-KEY-SET

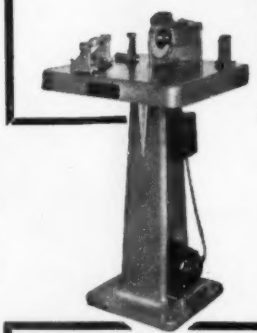
RE-SET-ABLE
Cooler dressing
Closer Tolerances
Micrometer Accuracy
Because: Wing key heat dissipation and absolute diamond lock nib.

● Three grades of diamonds. Common quality $12 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour template diamonds supplied only in Medium and Select quality.)

All diamond sizes ¼ to 10 karat are nib mounted for immediate shipment . . . Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, $1.00 post paid.) Grinders instruction card free.

The Most Complete and Up-to-the-Minute Line of Diamond Tools for War Production.
Send for Free Catalog.

DIAMOND TOOL COMPANY, Not Inc.
Sheldon M. Booth, Pres.
931 E. 41st Street CHICAGO, ILL.



FASTER, MORE ACCURATE CUTTER GRINDING ASSURED with the "BARNES"

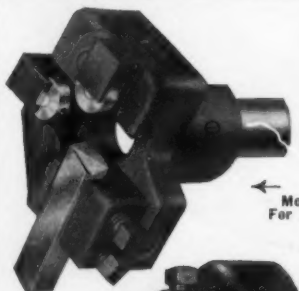
The Barnes Precision Cutter Grinder will grind formed cutters faster and preserve form absolutely. Cutter life is extended five to eight times over ordinary methods.

Utility and speed of the "Barnes" extends to the grinding of all types of cutters regardless of profile without changing existing cutter equipment. Form relieved cutters, sharpened on this machine become profile cutters. No high degree of skill is required to grind even the most complicated or irregular formed cutter.

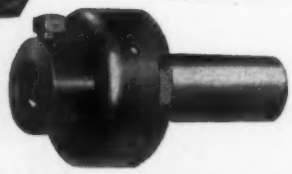
Send for Descriptive Circular

GENERAL MACHINERY CORP.
140 Federal St. Boston, Mass.

BOYAR-SCHULTZ SCREW MACHINE TOOLS
for Full Production and Maximum Accuracy



Model A For Turning



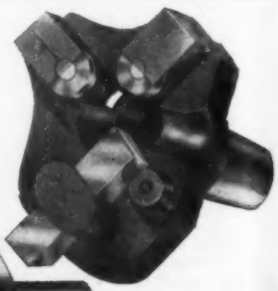
Model D Floatmer Tool Holder

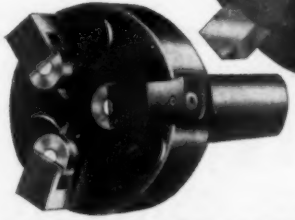
DESIGNED after long study of the demands for increasing screw machine production with no sacrifice in accuracy.

You can depend on Boyer-Schultz Tools.

BOYAR - SCHULTZ CORPORATION
2109-H WALNUT ST.
CHICAGO, ILLINOIS

Model B For Turning





Model C Burnishing Tool

2 Things to Remember

WHEN YOU ORDER HACK SAW BLADES

"A Borg-Warner Product"

First You need not be seriously handicapped by the restrictions on 18-4-1 for Hack Saw Blades, due to the shortage of vital alloys. The timely development of D-B-L Steel gives you lower cost blades with tough cutting edges, high impact resistance, and relative freedom from decarburization.

Second Only Ingersoll Steel Mills have had 4 years' experience in producing sheets of D-B-L Steel exclusively for Hack Saw Blades.

Blades made of Ingersoll D-B-L Steel are available from leading makers of Hack Saw Blades. Be doubly sure of satisfaction by specifying—"Made of Ingersoll D-B-L Steel"—on orders for Hack Saw Blades.

INGERSOLL D-B-L HACK SAW STEEL

(Tungsten 5.00-6.00
Molybdenum . . 4.00-5.00)

The remarkable performance of Ingersoll D-B-L . . . its relative freedom from decarburization . . . its tough cutting quality and its high impact resistance . . . plus its lower cost, have made it a wartime favorite.

INGERSOLL SPECIAL STEELS FOR SPECIAL USES

Alloy Steels
Armor Plate
Clutch Plate Steels
Tillage Steels
Soft Center Steels
Shovel Steels
Knife Steels
TEM-CROSS Steel
IngAclad (Stainless-Clad Steel)
Stainless Steels and Saw Steels, including "18-4-1" and Molybdenum and D-B-L Hack Saw Steels.

INGERSOLL STEEL & DISC DIVISION

BORG-WARNER CORPORATION

NEW CASTLE, INDIANA

Plants: New Castle, Indiana; Chicago, Illinois; Kalamazoo, Michigan

INGERSOLL D-B-L HACK SAW STEEL

Vitrified

Cuts longer between turns

Vitrified Grinding Wheels assure economy in high quantity production fine precision grinding because they cut longer between each wheel truing. Then, too, these long life, strong wheels require less redressing. They can also be depended on to eliminate gumming, glazing and heating.

All these advantages are available regardless of the grinding job, because there is a size, shape and type Vitrified Grinding Wheel for every grinding purpose. The completeness of the Vitrified line makes it possible for any shop to standardize on Vitrified Wheels.

Our engineers will gladly study your grinding operations and point out the savings you can make through the use of Vitrified Wheels.

BORITE—for all kinds and classes of steel grinding.

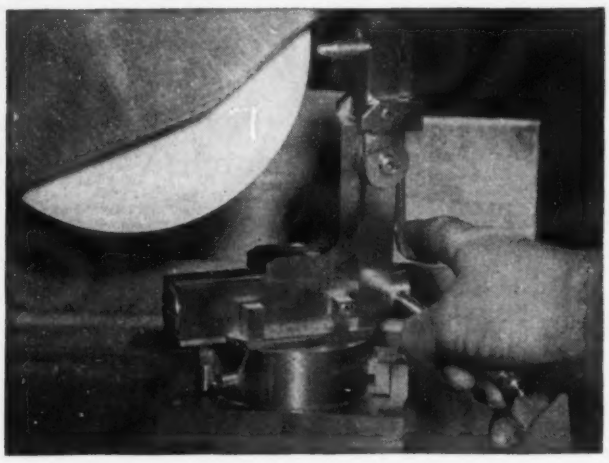
CARBORITE—for all classes of cast iron, brass, bronze and aluminum grinding.

Also, Silicate, Shellac and Resinoid Bonded Wheels.

VITRIFIED

VITRIFIED WHEEL COMPANY

WESTFIELD MASS.



An instrument of precision and versatility . . . Operation is simple requiring no high degree of skill for accuracy . . . Any one of the following can be produced with one setting:

One angle
Two angles
Concave radii up to 6"
Convex radii up to 4½"
Two angles and radius.
Many other diversified forms to meet requirements.

Wheel size capacity—9½" dia.; angular travel 3"; for use on universal surface and cylindrical grinders.

Full details available on request.

MANUFACTURED BY
J. & S. TOOL CO. 477 MAIN ST. EAST ORANGE, N. J.
PRECISION DRESSING TOOLS

Eighteen times a minute . . . 1,080 times an hour . . . 8,640 times in an eight-hour shift. That's the rate at which your workmen pull essential oxygen into their lungs. Is it clean air they're breathing or is it fouled with abrasive grit and dust from grinders and buffers?

You can find the right answer to this question and check off a menace to employees' health by trapping grit and dust at their source with the Cincinnati Air Master.

The Air Master is easily installed, easily cleaned and built in three sizes to fit all grinders and buffers. Write for complete information.

The Cincinnati

ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS

The Cincinnati Electrical Tool Co. 2676 MADISON RD.

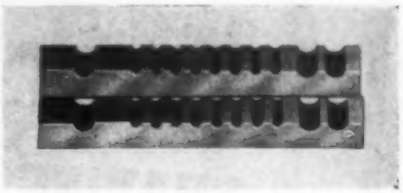
DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO

DRESSING IS SIMPLIFIED ... *by the New Time-Saving C-66* ... RADIUS DRESSER FOR SURFACE GRINDERS

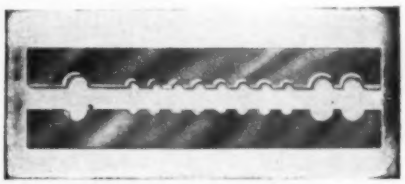
This low-priced, rugged attachment, for any make of surface grinder, dresses wheel without dismantling machine. Mounts directly on magnetic chuck. Does a one hour job in 10 minutes—accurately—conveniently.

NOTE how this Radius Dresser and two High Speed Tool bits replace an expensive Jig Boring Machine.

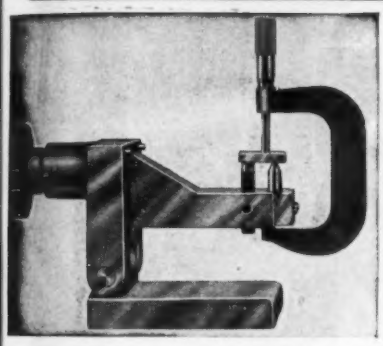
Drill Jig made with two high speed tool bits ground together on surface grinder, eight .062 holes, two screw holes, one dowel pin-hole. No drill bushings, no lapping, no hardening. Grinding time two hours fifteen minutes. Simple, easy, quick.



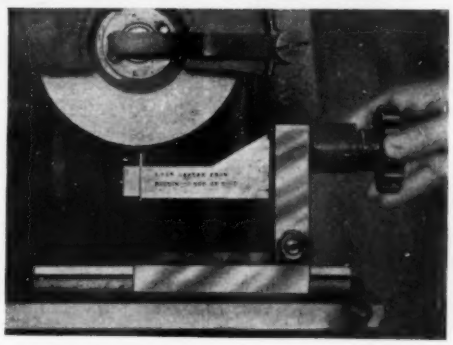
Two High Speed Tool Bits ground for drill jig.



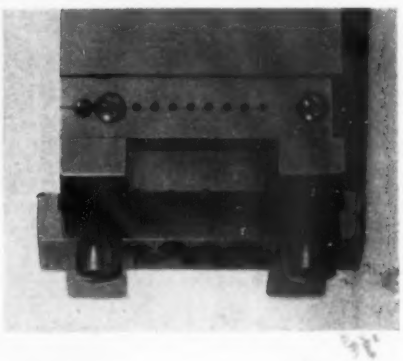
Drill jig completely assembled.



The diamond is set by simply measuring with micrometer from top of hood to bottom or arm.



The C-66 provides an important safety feature in that hands are kept away from under the wheel.



Drill jig completely assembled.

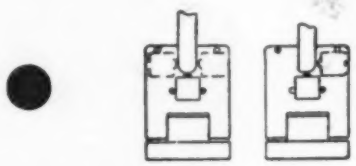
For dressing wheels for grinding turning tools, the dresser is set at angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.

The diamond holder is held against a ground vee in the arm. By means of this construction any size diamond up to 3/8" can be held accurately in line with the vertical center line of spindle.

Long Wearing Chisel Point Diamond

.013 Male and Female Radius

.500 Male and Female Radius



180° and 90° Male Dressing

Prompt delivery from factory in Newark, N. J. Price, without diamond, $82.50, 1/4 K diamond, $5.00.

SCHULTZ & ANDERSON CO.

MACHINE TOOLS

109 C EDISON PLACE NEWARK, N. J.

Standard

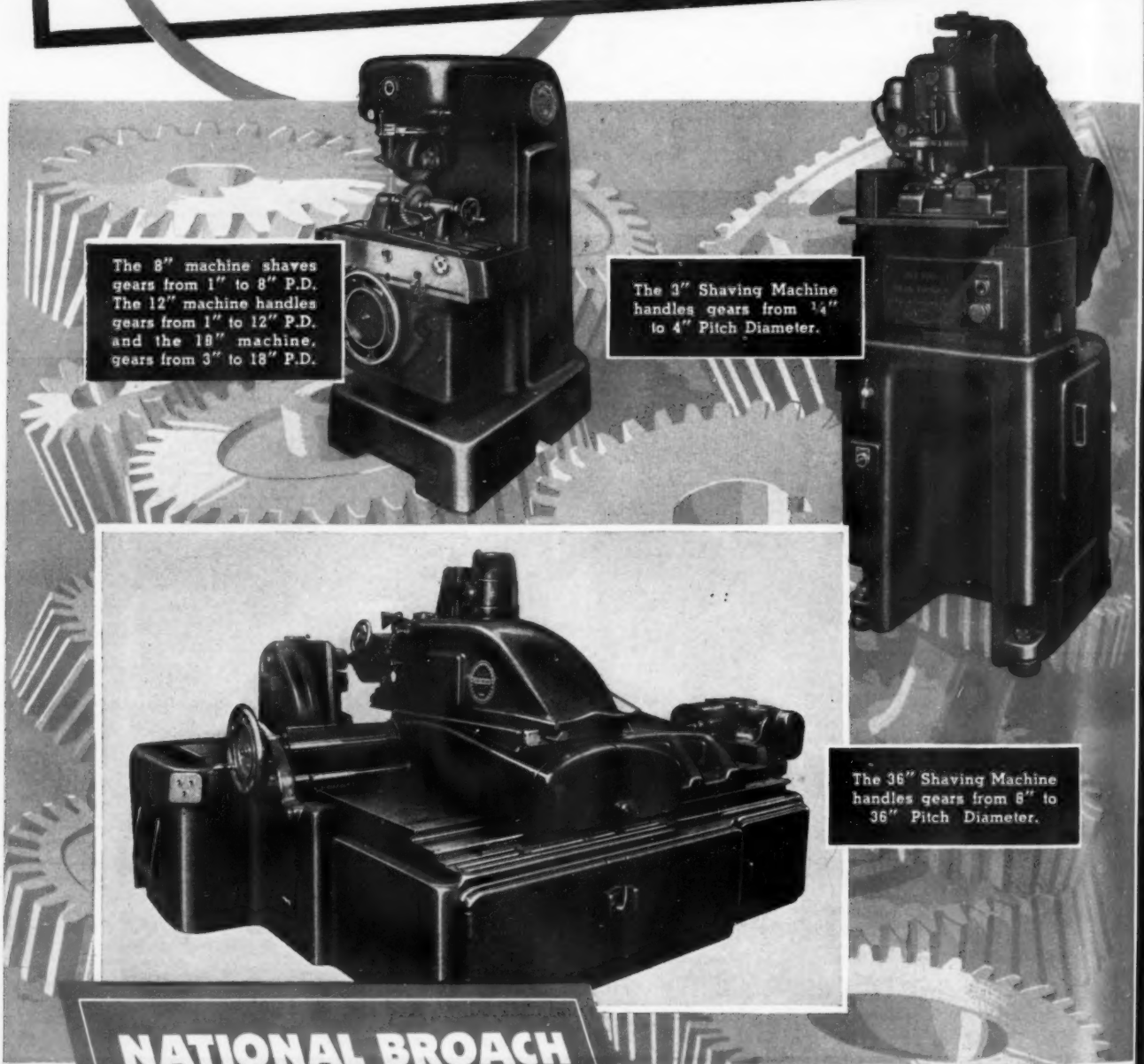
RED RING

ROTARY

SHAVING MACHINES

All of the machines illustrated except the 3" size can be equipped to shave ELLIPTOID (crowned) gear teeth. In addition to these, special machines soon to be available will process gears up to 96" P.D.

Write for descriptive bulletin on RED RING Gear Shaving Machines.



The 8" machine shaves gears from 1" to 8" P.D. The 12" machine handles gears from 1" to 12" P.D. and the 18" machine, gears from 3" to 18" P.D.

The 3" Shaving Machine handles gears from ¼" to 4" Pitch Diameter.

The 36" Shaving Machine handles gears from 8" to 36" Pitch Diameter.

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

5600 ST. JEAN · DETROIT, MICH.

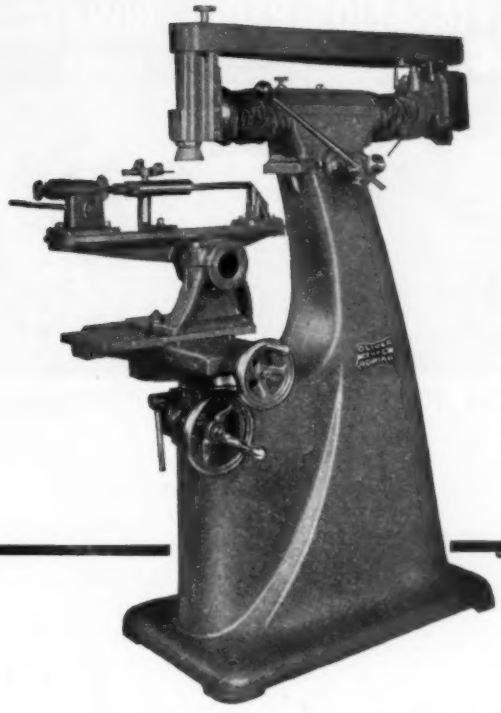
SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

An

"ACE"

OF PRODUCTION FOR THE BATTLE



Oliver "ACE" *Universal Tool and Cutter Grinder*

Keeping tools in condition to turn out maximum production is a big part of the battle on America's industrial front. An "ace" for this job is the Oliver Universal Tool and Cutter Grinder. Versatile, fast and accurate, it is capable of producing mathematically correct cutting teeth and edges on a wide range of milling cutters, end mills, saws, reamers, hobs and special tools. The Oliver principle of tool grinding is the reason for the increased speed and wide range of the ACE; the tool is held stationary and the grinding wheel traverses the work. This method permits the use of the simplest of fixtures, only two of which are necessary to grind the majority of tools. The wheel has a stroke of 10" through a rack and gear and a 15" bearing, all fully protected from dust and grit. Tool efficiency will help to win the battle of production! Keep your tools accurate and fast cutting . . . lengthen their useful life by sharpening them on Oliver Tool Conditioners.

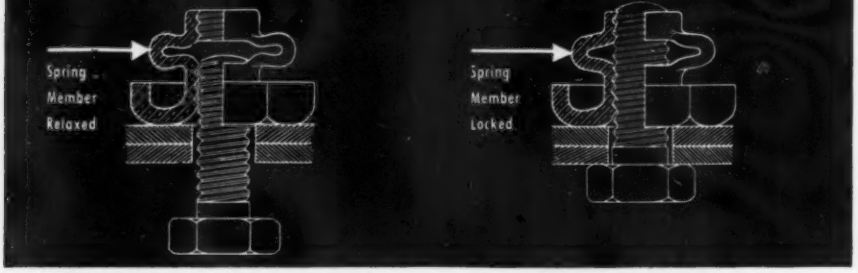
Don't Neglect Your Toolroom It's the Backbone of Production!

OLIVER INSTRUMENT CO.
1410 EAST MAUMEE STREET
ADRIAN MICHIGAN

Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS—TOOL AND CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

IT ASSURES VIBRATION-PROOF CONNECTIONS



ELIMINATES AXIAL PLAY

The Boots Self-Locking Nut is one piece, all-metal—withstands severest vibration. The top (locking) section is displaced in a downward direction . . . locking threads are out of lead with load carrying threads of lower section.

Upon insertion of bolt, top section of nut is extended to engage with threads of bolt. A constant force is thus established which locks nut firmly into position. Axial thread play is eliminated.

OTHER ADVANTAGES:

1. Because Boots Nuts are *all* metal, they are not affected by the corrosive action of oil, chemicals or water.
2. They have greater re-usability in maintenance than other nuts.
3. They resist high temperatures.
4. They meet the exacting specifications of all government aviation agencies in an industry where loose fastenings could not be tolerated.

There's a BOOTS NUT for every application

ROL-TOP

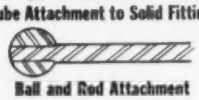
BOOTS

ANCHOR

BOOTS AIRCRAFT NUT CORPORATION
GENERAL OFFICES, NEW CANAAN, CONNECTICUT

TYPICAL APPLICATIONS

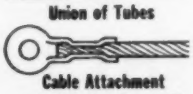
Tube Attachment to Solid Fitting


Ball and Rod Attachment

Hose & Flexible Tube Fittings

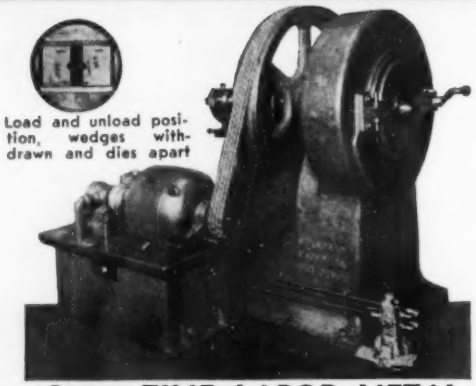
Metal Forms from Solid Bars

Union of Tubes


Cable Attachment and Electrical Terminals

New "STANDARD" HYDRO-FORMER

SHAPES AND JOINS METALS . . WITHOUT CUTTING



Saves TIME, LABOR, METAL

In one operation, this machine connects tubing or cables to solid fittings, or forms metal sections from solid bars without cutting. A feature of its design is the use of hydraulically-operated wedges to compress the dies so that swaging force is applied at right angles to the work . . . not obliquely as with tapered dies. In reducing outside diameter of tubing, therefore, tendency toward elongation is lessened and thickness of tubing wall is increased. Fittings having large ends can be put into machine without removing dies. This machine simplifies handling of many other operations which previously required more complex, time-consuming methods.

Further information on request

STANDARD MACHINERY CO.
PROVIDENCE RHODE ISLAND

Here's the

"KNOW-HOW" of GUN MANUFACTURE

. . . available as reprints from *American Machinist* ARMAMENT SECTIONS

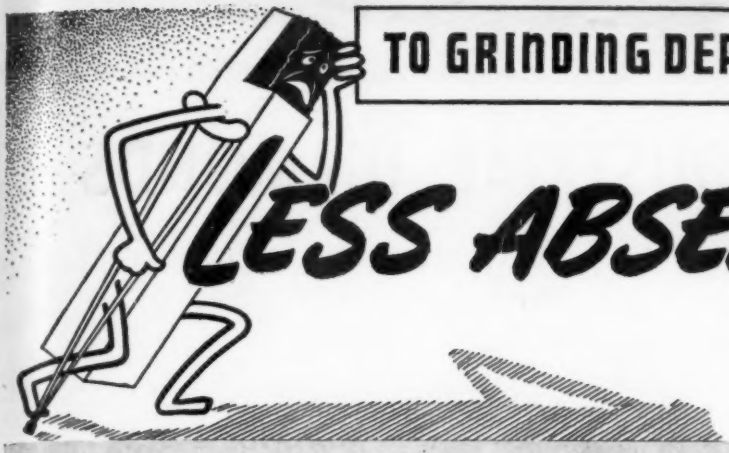
● Requests are still being received for the $1 volume on "Gun Manufacture". SORRY, BUT THIS IS NOW OUT OF PRINT. We do, however, have a limited supply of most of the Armament Sections from which the gun book was compiled. Check the list below and send for any sections you may want. Please include stamps, check or money order with your request.

THE FOLLOWING SUBJECTS ARE AVAILABLE

- *Arc Welded Gun Carriages*
- *Aircraft Bomb Fuzes*
  Big Forging for Tank Gun
- *Machine Work on Trench Mortars*
- *Bore Operations on Medium Caliber Guns*
- *Cartridge Links for Machine Guns*
  Flush Rivets for Speedy Airplanes
- *How G. E. Makes Pack Howitzers*
- *From Motor Cars to Machine Guns*
- *Welding Plays Top Role in A.A. Gun Recoils*
- *Boys Gun Operations*

PRICE 15c EACH
Supply is Limited

AMERICAN MACHINIST
330 W. 42 St., New York, N.Y.



LESS ABSEN-TOOL-ISM

with

TECO CARBIDE TOOLS

A great deal has been written about absenteeism among workers. But cutting tools that go off the job too often, also slow down production.

Reduce this "absen-tool-ism" by using TECO Carbide Tools . . . the carbides that stay on the job longer. They hold cutting edges and maintain accurate tolerances for longer runs, producing more pieces between grinds. Less grinds mean less machine-down time—thus more productive hours for your men and machines.

The greater resistance to wear and breakage provided by TECO Carbide Tools, is the result of rigidly controlled hardness, density and uniformity. TECO Carbide Tools and Blanks are available in grades, styles and sizes for practically every machining need. Have a representative discuss your requirements. Write for detailed catalog.

...cut at higher speeds

. . . hold cutting edges longer

...produce more pieces between grinds

... reduce grinding and re-tooling time

TUNGSTEN ELECTRIC CORPORATION

568 39th STREET • UNION CITY, NEW JERSEY

Branch Office: 2906 Euclid Avenue, Cleveland, Ohio

Rep.: Architects and Builders Building, Indianapolis, Ind.

Pioneers in Tungsten Carbides for over a Quarter Century

TECO CARBIDE TOOLS

"TRUMORE" INDUSTRIAL DIAMONDS

These are Natural, Elongated Stones. Since the cross section is relatively narrow, they remain reasonably sharp for general truing.

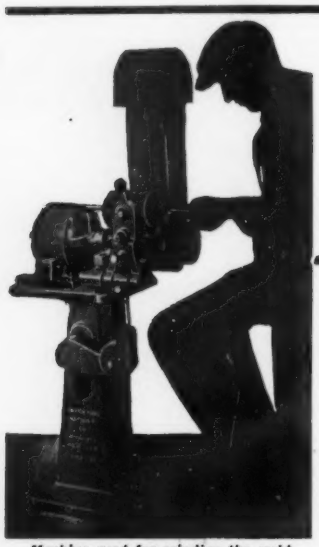
They set deep in the steel mounting and are therefore held more securely than a stone which is "blocky."

They stay in service until used up without need of resetting.

Mounted in any style of tool —Price—$28.00 for 1 carat, best grade; and $60.00 for 2 carat size. Satisfaction guaranteed.

Send your orders and inquiries today.

F. F. GILMORE & CO., 285 Columbus Avenue, Boston, Mass.



Machine used for grinding the weld of tubular airplane parts, lubricating frame parts, and other cylindrical pieces replacing hand labor.

"PRODUCTION" TYPE S

Centerless Polishing and Finishing Machine

A TIME SAVER ON CYLINDRICAL AS WELL AS FLAT WORK

This machine — which combines a centerless feed polishing machine with a vertical or horizontal belt grinder, surfacer, polisher or buffer—can be quickly changed from horizontal to vertical. In a horizontal position it provides an ideal means for hand surfacing. It can be used for work of any material that can be ground or polished, including metals, rubber, fiber, wood, etc.

A Centerless Feed Attachment enables this machine to automatically feed cylindrical work from ¼" to 1" diameter, without centering or chucking. Flat, irregular work can also be finished by hand manipulation by merely removing flat surfacing bed.

Abrasive belt is 4" wide; belt speed 3200 ft. per min.

Send for descriptive literature giving complete details.

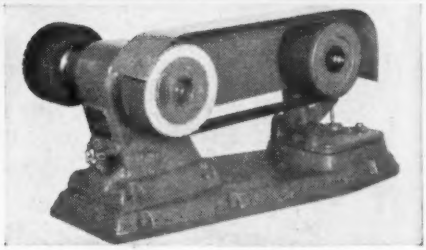
PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

A PRODUCTION TOOL for Faster Grinding, Deburring, Finishing

JONES BENCH GRINDER and Polishing Machine NO. 135



This high production unit finds a wide range of uses on all types of grinding, deburring and finishing work—from flat pieces to irregular-shaped parts. Uses endless, fast-entry abrasive belts. Features precision ball-bearing construction, controls handy to operator. Segment Face Contact Wheel, and Jones 3/M Rubber Contact Roll.

WIDE RANGE OF USES

Aircraft parts finishing and deburring . . . Metal parts and Plastic finishing . . . Weld grinding . . . Flat and irregular shape grinding and finishing . . . Flashing, grinding and finishing of small Forgings . . . Cutlery, Tools, Chisels, Drills, etc., grinding and finishing . . . and a host of other uses.

Speed your production with Jones Bench Grinders. Other types to suit your requirements. Write today for Bulletin No. 135.

JONES ENGINEERING COMPANY

DEPT. A-3, ELLWOOD CITY, PENNSYLVANIA

New Delta Chip-Breaker Grinder is simple, fast, dependable, accurate — and *much lower in cost . . .*

Gives all-around, long-time satisfaction in grinding the chip-breaker groove on carbide-tipped tools—used also for other production grinding

M-1

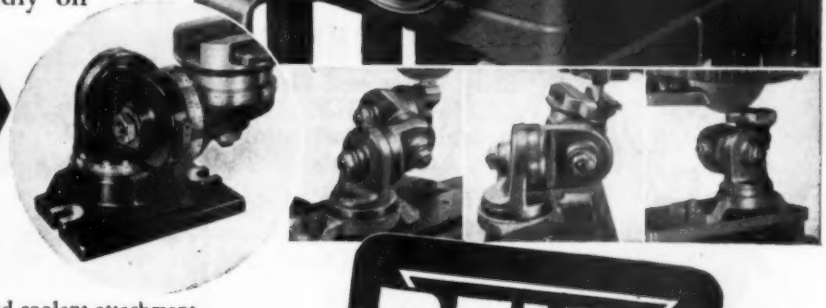
In grinders costing many times as much, you do not find many of the new, exclusive features you get in this latest Delta machine. It's husky, solid (weight 700 pounds), over 6 feet high, an accurate machine designed to turn out a big volume of work. Yet its cost is amazingly low.

Spindle shaft specially designed. Bearings widely spaced to provide permanently true alignment. Wheel mounting system permits removing either wheel alone, or wheel and adapter. Table is smooth operating with convenient control wheels — rides solidly on long ways.

Equipped with the new "UNIVISE"

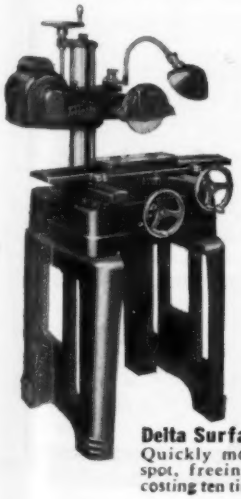
. . . holds the tool at any conceivable angle

Four distinct planes of adjustment. Can be accurately reset at a moment's notice so that the tool may be reground at *precisely* the same angles as originally set. Saves time, wheel wear. Eliminates bothersome and often inaccurate measurements.



With Univise and coolant attachment removed, this machine may be used as a regular surface grinder.

The features and performance of this Delta machine are amazing to those accustomed to paying far more than its cost. Investigate — be first in your plant to discover the convenience and economy of this new Delta grinder. See it at your Delta industrial distributor's — check priorities and deliveries.



Delta Surface Grinder
Quickly moved to any spot, freeing machines costing ten times as much.

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TEAR OUT AND MAIL THIS COUPON FOR FULL DETAILS

THE ARMY-NAVY "E" — *awarded for excellence in the production of machine tools vitally needed in the war effort.*

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Please send me your new catalog giving full details on the Delta Chip-Breaker Grinder and your full line of low-cost machine tools.

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Company.....

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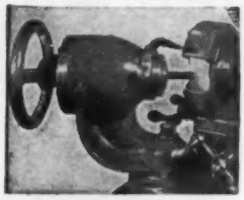
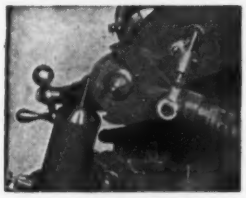


Sharpening Chamfer

All lands sharpened with each revolution of hand wheel—relief and chamfer angle variable.

Grinding Flutes

Easily and quickly reproduce or change hook. Upright position affords unobstructed view of work.



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Spiral points can be produced or duplicated with adjustable head on vertical slide.

● ● ● LENGTHEN TAP LIFE

● ● ● SALVAGE BROKEN TAPS

● ● ● SHARPENS ALL THE VITAL POINTS

OTHER IMPORTANT FEATURES: Belt driven precision ball bearing spindle permits use of any type motor. Capacities—Machine Screw to 1⅛" hand taps—2 to 10 flute right and left hand. Three sizes inter-changeable heads—each engineered to a specific range. Three models—Bench Type—Floor Type—Floor Type with Built in dust collector.

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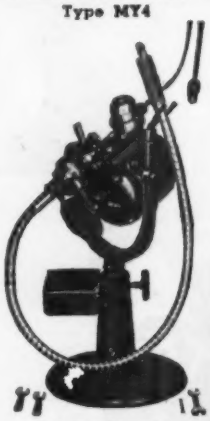

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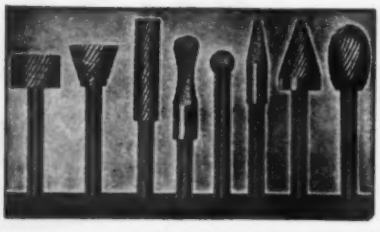

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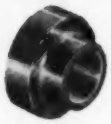
SUNNEN PRECISION HONING MACHINE!

Hydraulic Metering Valve Stem. Hole .156" in diameter; reamed, heat treated, and then honed. Honing 3 times as fast as previous method.



Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter — held to .0002", stock removal .001", sixty per hour.

Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping—and gave a straighter hole.

Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

Production Increased — Time Saved!

Cast Iron Valve Stem Guide. 1/2 to one thousandth removed —220 pieces per hour. Better finish and straighter hole.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Idle Valve Guide. Honing after grinding holds a .0002" limit necessary for accurate idling.

Shell Loading Die.

Closer Tolerances — More Accurate Work

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

Aircraft Carbureter Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Compressor Yoke. Alignment maintained and better finish produced.

Mild Steel Clevis. Honing corrected errors of previous operations and maintained true alignment of two holes.

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Carbureter Idler Valve Jet. Hole is honed after reaming for smooth action.

Roller Bearing Outer Race. Finish improved from 12 micro inches to 2 micro inches.

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Ceramic Insulator. Honing used to eliminate roughness inside ceramic tube.

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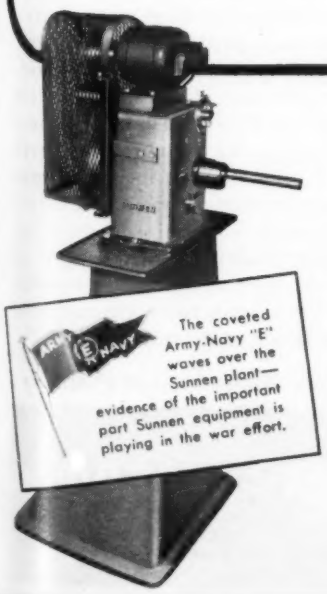

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

The basic price of the Sunnen Precision Honing Machine is only $195! And operating costs are low.

No jigs or fixtures needed — work can be held in the hands. Relieves big internal grinder for other jobs.

Wide range — handles any internal diameter from .185" to 2.625".

Protect your investment in time, labor, and materials in your previous operations by using the Sunnen method for the LAST operation.

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Here's good news — girls in 'teens can be trained to handle jobs in "tenths" in a few hours.

Sunnen guaranteed accuracy assures fewer rejects and absolute interchangeability of parts.

One of our sales engineers will be glad to help you solve your honing problems. Or, if you prefer—write for free bulletin giving complete information.

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INCREASE PRODUCTION—SAVE TIME—TOOLS

Gear-type pumps for high pressures — Centrifugal model for high volume. Capacities 50 to 1000 gallons per hour.

Use Coolants *Applied by* GRAY-MILLS *Portable* COOLANT SYSTEMS

HERE is the simple, economical way to equip your machines to use coolants—to help them produce more and better work — faster! Gray-Mills Systems have increased the efficiency of hundreds of machines on operations like drilling, milling, sawing, grinding, honing, tapping, threading and cutting. They are quickly and easily set up to operate either as a permanent or temporary part of a tool. Sturdily built Gray-Mills Systems are available in both gear and centrifugal types with capacities from 50 to 1,000-gal. per hour—controlled flow. Prices range from $39.50 to $189.50.

If you want to modernize your older machines—equip small, large or special tools for greater efficiency —or have a "standby" and "clean out" system there is a Gray-Mills for the job. Call your distributor or write direct.

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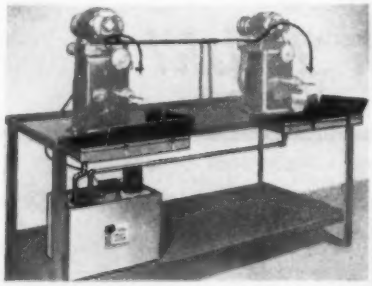
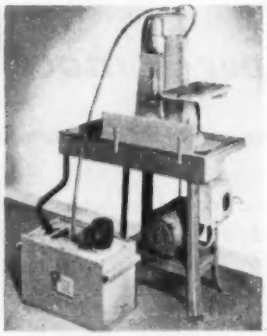
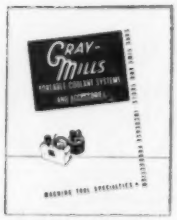


Two Sunnen Hones, served by "A" Series Model, with Flo-Bac-Pans.



Abrasive Finishing Machine and "A" Series Model Coolant System.



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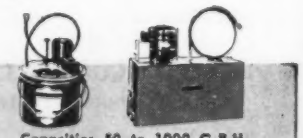
. . . . 5 types for most requirements—10 and 55 gal. containers—immediate delivery from your distributor or our plant.



Capacities 50 to 1000 G.P.H. Pressures 8 to 150 lbs.

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Break Production Bottlenecks

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A new line of abrasive wheels and points with patented construction features that place a fresh abrasive surface constantly in contact with the work and allow full use of the spiral roll, down to its final layers. These sharp, cool and smooth-running abrasive wheels and points can easily deburr exterior edges and finish irregular surfaces, ordinarily hard to get at—such as holes, openings, and corners. For use on hard alloy steels, wood, rubber, resin and plastics. Mandrels are of tapered thread construction which firmly locks the abrasive wheel or point to the shaft by its rotary motion. Inexperienced operator can instantly remove or replace wheel or point from mandrel without use of tools, nuts, split shafts or grommets. Our engineering department and field representatives are at your service.

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AND THERE'S REASON for that talk! These resilient abrasive cloth specialties on your own portable or flexible shaft tools save time, pyramid output and improve the product.

TIME IS SO VITAL that when you cut it as much as 90% on many operations, you accomplish something very worth while for your firm's war effort.

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SOLVING PROBLEMS INVOLVING MULTIPLE SPINDLE OPERATIONS A Buhr SPECIALTY

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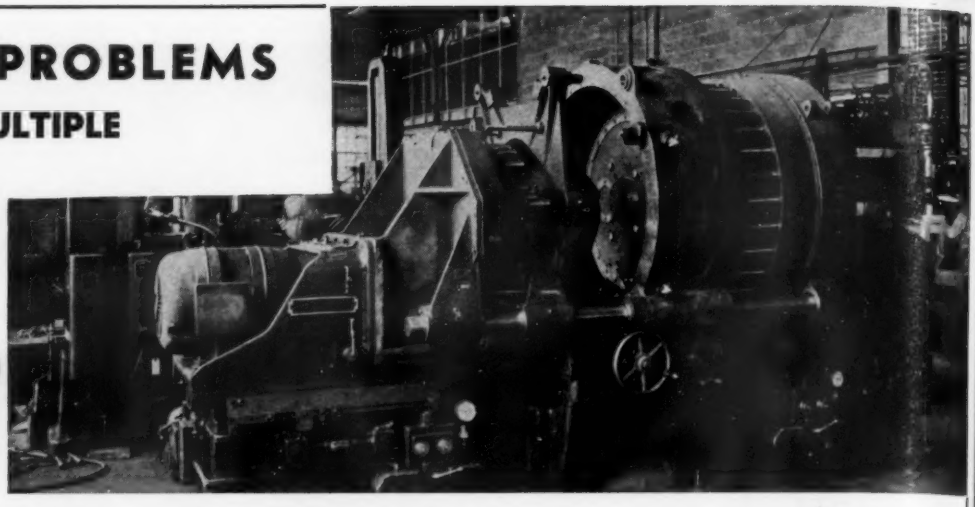

Tooling consists of a fixture for clamping an anti-aircraft part of which one side is a bushing plate. Right hand head has 82-spindles, and Left hand head has 38 spindles with a sliding bushing plate for removal of part from fixture.

All spindles have vertical adjustment for drill adjustment. An oil pump is provided in each head to insure positive lubrication to all ball bearings in the head.

These heads are direct motor driven and mounted on ways and are moved in and out by hydraulic cylinders.

If you have a production problem, let Buhr engineers help you.

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Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment

CARLTON RADIAL DRILL

"Anti-friction Bearings Throughout"

FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

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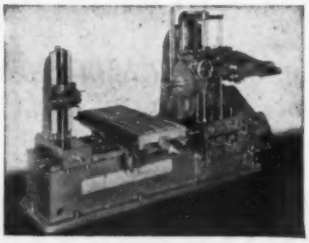
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



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Horizontal Boring, Drilling and Milling Machine

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For embossing and stamping lettering and designs on all products

Master hobs and cavities for all insignia and buttons.

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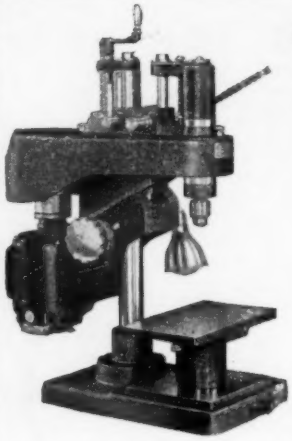

FOR GREATER SPEED RANGE, SENSITIVITY AND EASE OF OPERATION . . .

HAMILTON "VARIMATIC"

. . . SUPER SENSITIVE, VARIABLE SPEED DRILLING MACHINES!

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LOW RANGE
Min. Spindle Speed 840 — Max. Spindle Speed 2700

HIGH RANGE
2900 — 9300

DRILL CAPACITY
.004" to 5/16"

Here's a unit built with "instrument precision", fully capable of handling the finest work for both defense and peacetime production. Combining sensitivity and ease of operation, the "VARIMATIC" allows instantaneous, variable speed adjustment in two ranges. (Speed changes are accomplished by means of a hand wheel. A graduated dial on hand wheel shows the speed at which the spindle is operating.) A letter will bring complete details—write!

The Hamilton Tool Co.

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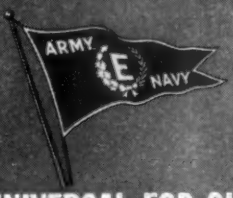

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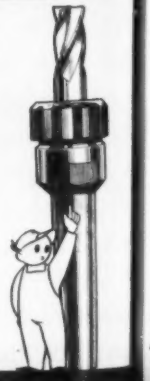
We are proud to announce that we have been awarded the coveted Army-Navy "E" in recognition of the quality and quantity of the Universal precision parts we have been producing for America's war effort.

You can improve your production with Universal Collet Chucks which grip as strong as solid steel in both a radial and axial direction without marring the tool shank. Write for complete Collet Chuck catalog.

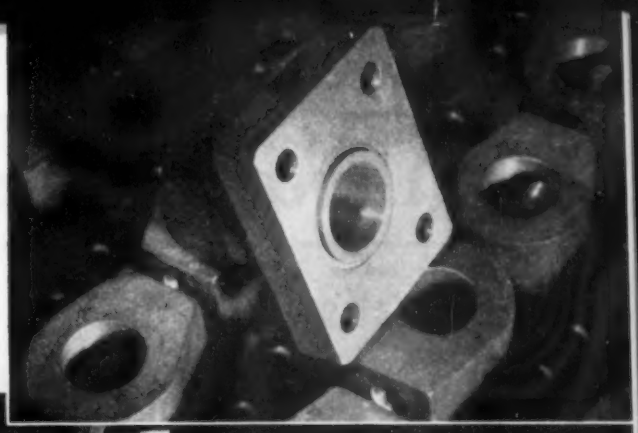


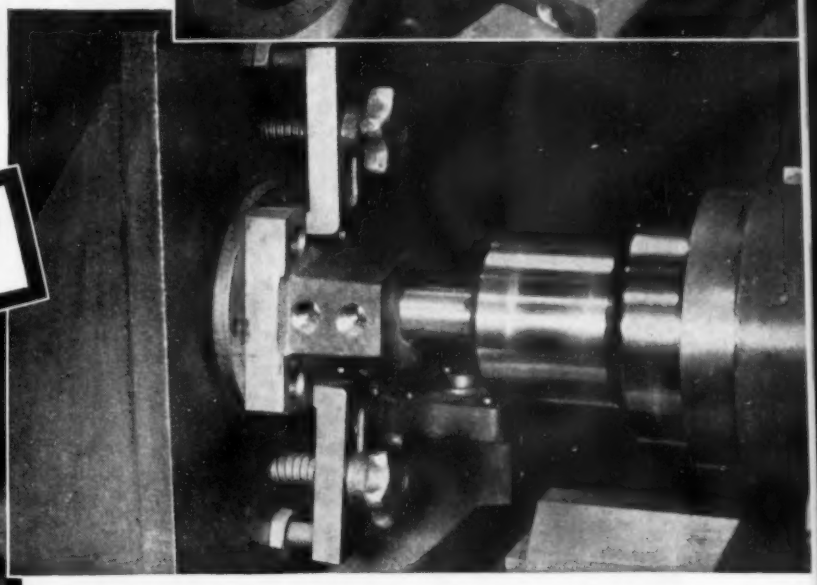
UNIVERSAL ENGINEERING CO.

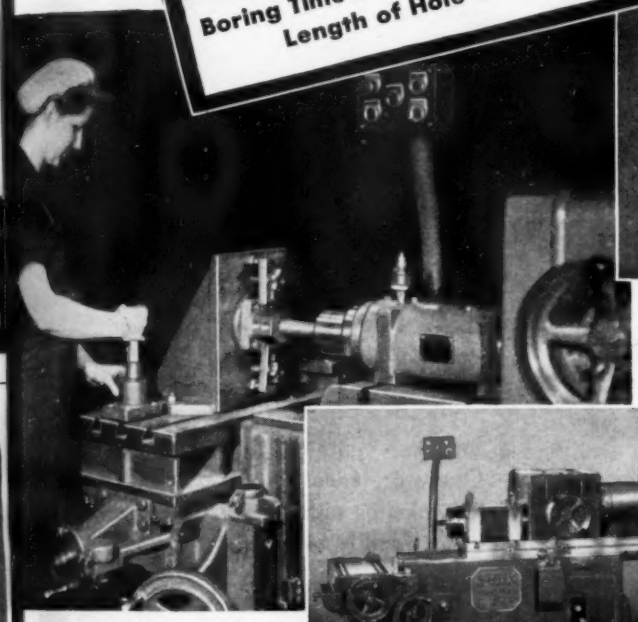
FRANKENMUTH · MICHIGAN

Accuracy Held to $\frac{+.0005''}{-.0000''}$ in Finish Boring Flanged Tool Holders on *Knee-Type* STOKERUNIT SIMPLEX PRECISION BORING MACHINE

Boring Time 2¼ Minutes Per Hole
Length of Hole 3 11/32″

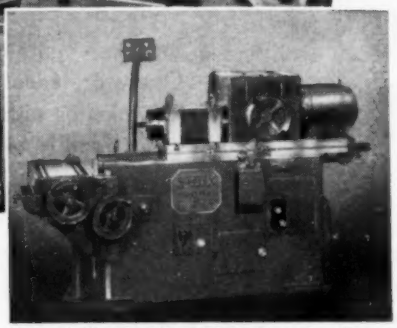






(Left) Automatic precision operation—girl worker maintains accuracy and finish in production.

(Above) Work piece is accurately held in simple fixture with hand clamps.



(Above) Simplex Knee-Type Precision Boring Machine with No. 4 Spindle, variable speed spindle drive and turret stop for table.

In precision boring the hole in this flanged tool holder for turret lathes, the Knee-Type Stokerunit Simplex Precision Boring Machine maintains extremely close tolerances in diameter and location. High finish is also assured.

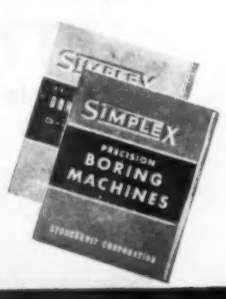
Boring Data: Dia. of finish bore is 1.500″ (+1.5005″ −.0000″). Length of bore is 3 11/32″. Work piece accurately located in fixture on counter bore flange. Finish boring time is 2¼ minutes each. Spindle speed 850 r.p.m.; feed 1½″ per minute. Approximately 150 pieces are bored per sharpening of the tungsten carbide cutters.

Versatile *Universal* Performance

This manufacturer of machine tools is using the Knee-Type Stokerunit Simplex Precision Boring Machine for a wide variety of precision boring operations. For example, boring a number of holes in various locations on a multiple tool head is accomplished with maximum efficiency on this machine. Knee is adjustable vertically—table laterally. Built-in dial gauges, graduated in ten thousandths, with precision length bars, permit accurate table positioning. Rapid traverse of spindle unit provides quick approach to cutting position and return at end of machining cycle.

To Solve Your Precision Boring Problems . . . get the complete Stokerunit story today. Over 25 models of Simplex Precision Boring Machines cover practically the entire range of precision boring applications. They are available in mechanical and hydraulic feeds, with single or multiple spindles, for either short-run or production work.

For specific recommendations, send blueprints of parts with production requirements. No obligation.



Write Today for these two booklets covering details of our entire line of Simplex Precision Boring Machines.

STOKERUNIT CORPORATION

DESIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES

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"Almost human"

... that's what many users say about the

Ettco - Emrick
FOOT-OPERATED
TAPPING MACHINE

And they say it because this machine does fast, accurate tapping almost automatically. All it needs is someone to feed the work and step on the foot pedal.

The skill ordinarily required in tapping is supplied by the exclusive Ettco - Emrick Tapping Head with its high speed, hair-trigger sensitive central friction clutch and automatic reverse, and the sensitively counterbalanced foot pedal and drive mechanism.

That's why unskilled operators —men or women—can maintain a production of **2400 accurately tapped holes per hour** with the standard 2-spindle Head —and up to 12,000 per hour with available Ettco-Emrick Multiple Spindle Tapping Heads.

GET FULL DETAILS IN THESE BULLETINS

BULLETIN No. 4
Covers the Tapping Machine

BULLETIN No. 3
Covers the Multiple Heads

Copies mailed to you on request. Write for them today.

IF YOU WANT MAXIMUM TAPPING PRODUCTION

The Ettco-Emrick Tapping Machine is only one factor. You must also use the right method of handling parts, the right work holder and the right taps for the job. Our recommendations, based on 25 years of specialization in machine tapping, are always available to users of Ettco-Emrick equipment.

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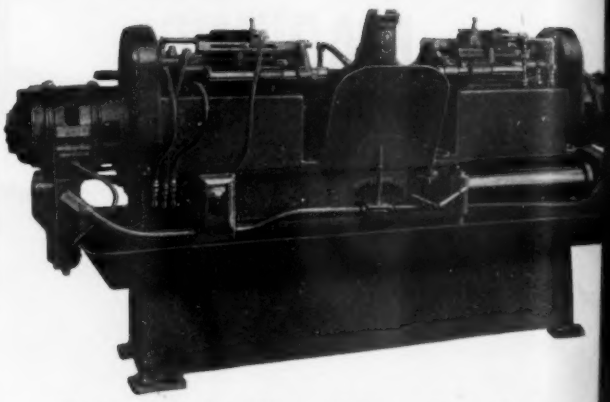
The famous Ettco-Emrick
DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

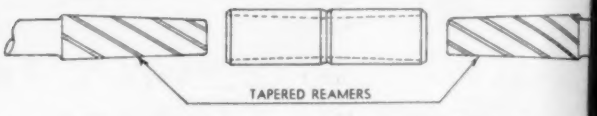
SIX PISTON PINS

taper reamed at both ends IN ONE MINUTE WITH ····

HOEFER HYDRAULIC UNI



This double end machine contains two 3-h.p. Hoefer Hydraulic Units and a Hydraulic Fixture—used for taper reaming both ends of piston pins. Machine is entirely automatic.



• The machine is equipped with long hopper feed. Operator feeds this hopper and machine runs for 10 minutes without any further attention. Then another feed is necessary.

The piston pins reamed in this particular job were 1 1/16" O. D. by 3⅝" long. Provision was made so that reamers could not collide.

• HOEFER UNITS suitably mounted and equipped with HOEFER Multiple Spindle Heads eliminate expensive and hard to get drilling equipment. They meet every production drilling requirement at a fraction of the cost of special drilling equipment.

Consider the many advantages of this equipment for post-war production. It will never be obsolete—you will have maximum flexibility—it will operate horizontally, vertically, or at any angle —adaptable to a wide range of work.

We are ready to discuss your drilling with you now.

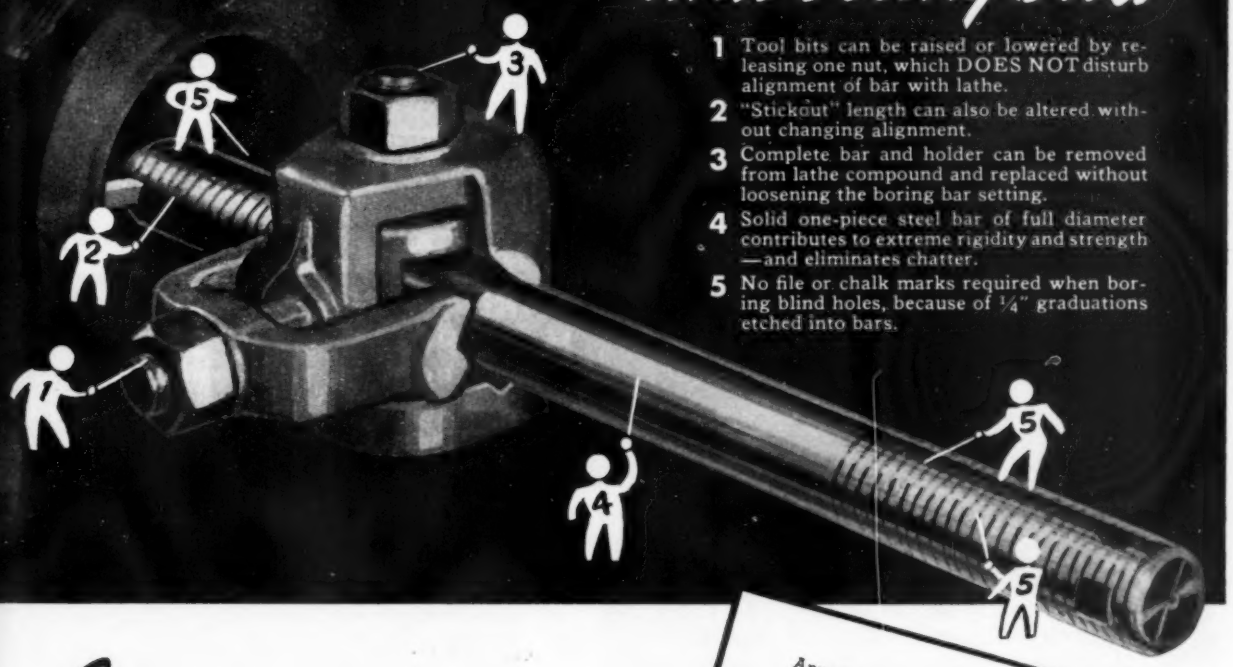
HOEFERS WHOLE BUSINESS IS HOLES

HOEFER MFG. CO. *Freeport,*

New Design Saves Time and Speeds Production

CLAYTON

Boring Bar Holders —and Boring Bars



1. Tool bits can be raised or lowered by releasing one nut, which DOES NOT disturb alignment of bar with lathe.
2. "Stickout" length can also be altered without changing alignment.
3. Complete bar and holder can be removed from lathe compound and replaced without loosening the boring bar setting.
4. Solid one-piece steel bar of full diameter contributes to extreme rigidity and strength —and eliminates chatter.
5. No file or chalk marks required when boring blind holes, because of ¼" graduations etched into bars.

Clayton Boring Bar Holders are quickly paid for in reduced set-up time. They are more rigid, permit deeper cuts, speed shop production. Available for lathes from 6″ to 48″.

PROMPT DELIVERIES ASSURED
Order from your local supplier or direct from factory

Any size Boring Bar (within capacity of Holder) fits through Bar Holder Body (A). Sliding dowel pin (B) maintains perfect alignment of clearance hole (C) in center post with V slots in Bar Holder body (A). Nut (D) rigidly clamps bar in holder. Nut (E) clamps body assembly to lathe compound. Either adjustment is made independently and without disturbing the alignment or adjustment of the other.

ARMY E NAVY

CLAYTON MANUFACTURING COMPANY
ALHAMBRA, CALIFORNIA

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ARE YOU INTERESTED IN BETTER TAPPING?

If better production tapping is your objective, it will be to your advantage to come to Card. We can help you because we sell better tapping performance.

The high quality of work done—the quantity produced—the economy of using Card Taps—will be apparent on any tapping job. Just put Card Taps to work and let them prove their superiority.

A regular catalog tap in most cases will meet your needs without using special taps. You'll find your requirements covered in the Card Catalog No. 34. Write for a copy.

Card taps are sold by leading dealers everywhere

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Mansfield, Mass., U. S. A.
DIVISION OF UNION TWIST DRILL CO

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spent adjusting indicators

For Jigborers, Boring Mills, Milling Machines. It fits all popular indicators. The above illustration shown complete with extension bar.

NO more tiresome tapping your indicator into position. Now — after locking to approximate position, you obtain final setting by simply turning Micro Adjusting Screw. This exclusive, time-saving feature of the OSLUND HOLDER for all popular indicators gives you ***complete control.*** Write today for details.

ANOTHER TIME-SAVER

This Holder produced by makers of Oslund Indicators — the shockproof, constantly accurate indicator, whose 360° dial is read from *all* sides. Write Oslund today

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We are proud to announce that we have been awarded the coveted Army-Navy "E" in recognition of the quality and quantity of the Universal precision parts we have been producing for the war effort.

We are also glad to announce our new product, Universal Mikrolok, the precision boring bar which can be quickly adjusted as easily as a micrometer to limits of .0005 or less. Write for catalog.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH • MICHIGAN

JOB TIME REDUCED FROM TEN MINUTES TO THIRTY SECONDS WITH...

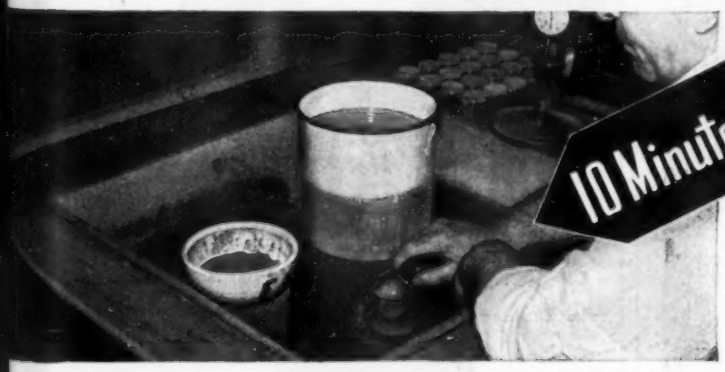
Walker-Turner Drill Heads..

THE compactness and flexibility of Walker-Turner Drill Heads makes it easy to design special tooling set-ups. An interesting application is shown here in the plant of William Mogey & Sons, manufacturers of precision optics. The customary method of rough grinding is shown in the lower illustration, this operation requiring ten minutes.

Two Walker-Turner Drill Heads assembled into an automatic machine completes the same operation in ten seconds. This is an indication of how Walker-Turner Drill Heads can be used in special tooling arrangements for intricate drilling, tapping, reaming and grinding operations. Such set-ups can be made quicker and at lower cost than by processes and methods formerly used. Prompt delivery of Walker-Turner Machine Tools is assured to war industries.

30 Seconds

WALKER-TURNER COMPANY, Inc.
4573 Berckman Street, Plainfield, N. J.



CONSTRUCTION FEATURES

★ One Piece Head Casting, Precision bored to assure correct bearing alignment.

★ Six spline spindle runs on four precision ball bearings.

★ Pulley straddle mounted between bearings to eliminate spindle "whip".

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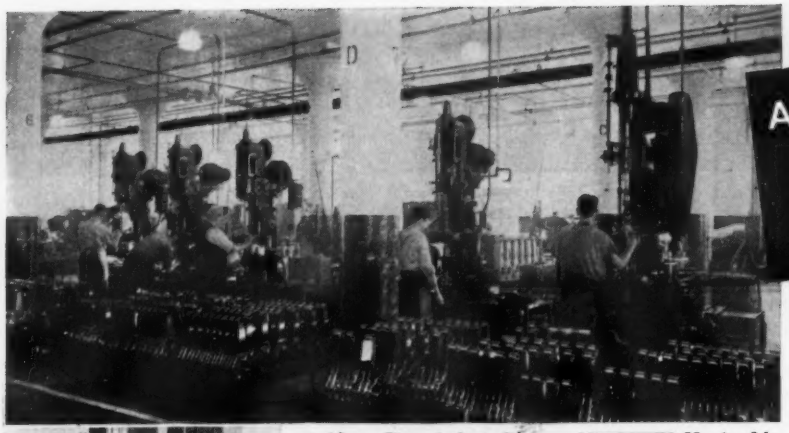
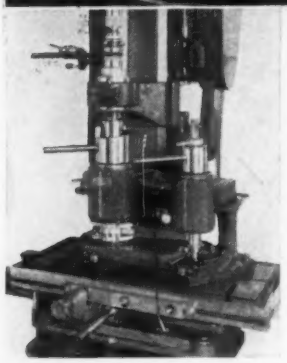
DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS



Aircraft Connecting Rods Honed to Limits of 0.00025"



Above: Five of a large battery of **BARNESDRIL** *Honing Machines for honing various parts of aircraft radial engine.*

A prominent manufacturer has installed a large battery of **BARNESDRIL** Honing Machines for honing various parts of an aircraft radial engine. The close-up view at the left shows the fixture set-up for honing the crankshaft bore and the wrist pin hole in the connecting rod. The rod is honed before and after hard chrome plating and held to limits of 0.00025". Other machines in this factory hone cylinder barrels, articulating rods, six radial arm holes in propeller shafts, valve guide bushings, counterweights, rear end crankshaft, and supercharger housings.

Honing is Adaptable to Many Bores

BARNESDRIL Honing Machines are made in vertical, horizontal, and angular types, with one or more spindles, for honing the interior of any bore, requiring smooth, accurate finish. These honers are made in a wide range of sizes to handle work up to more than forty-two inches diameter and lengths to seventy-five feet or longer.

BARNESDRIL engineers will be glad to recommend the proper type and model of honing machine for your specific production requirements. Send blueprints of parts for analysis and suggestions. No obligation.

Free Honing Data

Here's a valuable booklet with complete details of the "Honing Process" and our entire line. Write for free copy of Honing Process Bulletin No. A-121.

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Boring Heads

Speed

PRODUCTION

These Criterion heads save time! Smooth, compact, rigid! Large, easy-to-read, graduated dial. Lead screw is hardened tool steel. ITS THREADS ARE GROUND FROM THE SOLID AFTER HARDENING, assuring constant accuracy. Parts subject to wear are hardened. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3" ½" and 1" bar capacity Ask your dealer, or order direct. Request free literature

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Fixed-Center Auto-Reverse Multiple Tapping Heads

All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

ELIMINATE EXCESSIVE FRICTION
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And You Immediately Correct Most of Your Breakdown troubles and . . . . . .

STEP UP PRODUCTION

THESE BLADES
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2 ***Because they are tapered* their full length, Luers Blades T Series prove exceptionally efficient for cut-off operations. They maintain a constant back clearance through repeated resharpenings. Only front face ever requires resharpening.***

3 ***Side clearance is provided on both sides of blade by virtue of its "T" shape.***

All these features, found only in Empire Tool Company's Luers Patented Cutting-off Blades, contribute to the elimination of excessive friction. They make for greater production, with less effort and with less waste of time—and incidentally, with the greatly desired advantage of conserving critical materials.

** Parallel Blades on longitudinal cutting width available for shallow cut-offs and grooving operations.*

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The Blades That Reduce Friction

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this "Buffalo" DRILL DOES A 5-FOLD JOB..

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VERSATILE, sure—but that's not the only merit of this 3-spindle Buffalo Drill on a vital war production job. In addition to its all-round utility are the extra advantages of handy controls and the many time saving features provided by simplified, easy-to-adjust sliding heads and tables. All in all, this Buffalo Drill symbolizes the design and workmanship which have won for "Buffalo" so prominent a place in efficient war production.

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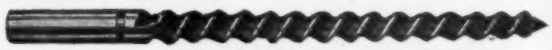

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The Vernon Universal Tool & Cutter Grinder has a *large* capacity, accurately handling big cutters as well as small delicate tools.

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Vernon Line of **HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS**

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A MEDIUM HIGH CARBON OPEN HEARTH PRODUCT

ONE *Steel that gives you . . .*

1. Excellent *machinability*
2. Greatly extended *tool life*
3. Good *finished* parts
4. High *physical* properties
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7. Minimum *distortion*
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"SPEED TREAT" STEEL offers an unusual *combination* of features never before found in ONE steel in the medium carbon, open hearth field. The eight features above make it an excellent substitute for ALL medium carbon, carbon steels.

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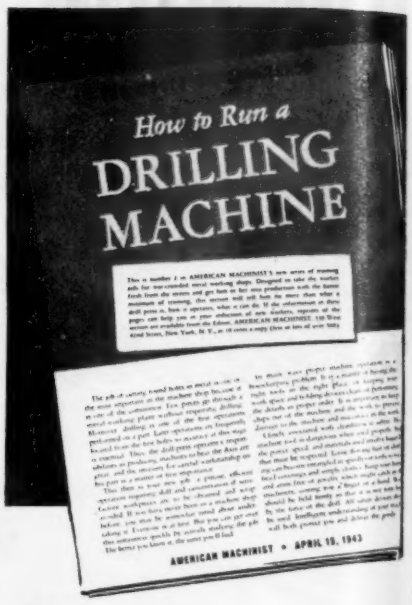

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● A 16-page, illustrated, practical training course on elementary shop practice as applied to drilling. Designed to help production executives take men or women workers fresh from the streets and make efficient machine operators out of them in shortest possible time.

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The Douglas Miller combines rigid, well balanced design with convenience of control making it particularly suitable for accurate work in tool room as well as for general production. It is available in plain or universal type.

Showing operation with Universal Milling attachment on tool room job producing a production fixture.

Showing operation with four cutters machining alloy steel for high precision aircraft parts.

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The Rotorex Universal Tool and Cutter Grinder will accurately perform all kinds of tool grinding operations. Readily interchangeable attachments are available to set up machine for single-purpose jobs such as cylindrical, internal and radius grinding.

Operation showing set-up for internal grinding.

Operation showing set-up for sharpening straight gash hobs.

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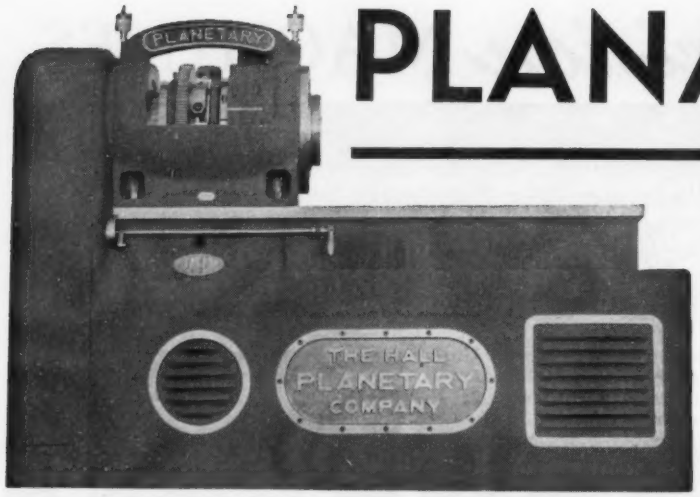
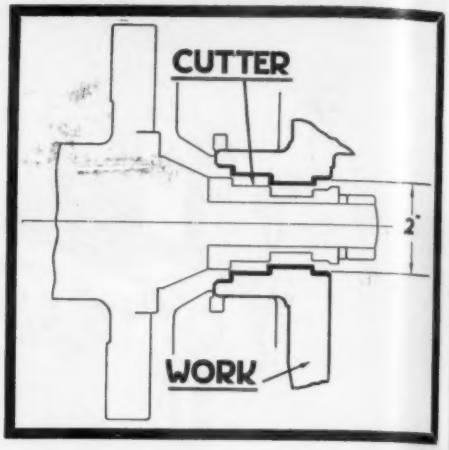
PLANAMILLING





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Performed in 3 Minutes

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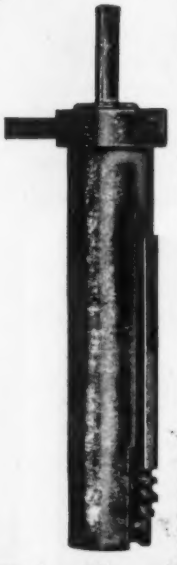

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

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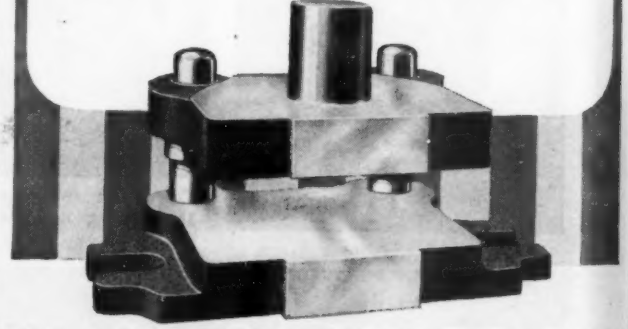
Our No. 9 Die Set Catalog gives complete engineering information on Die Sets and Die Makers' Accessories.



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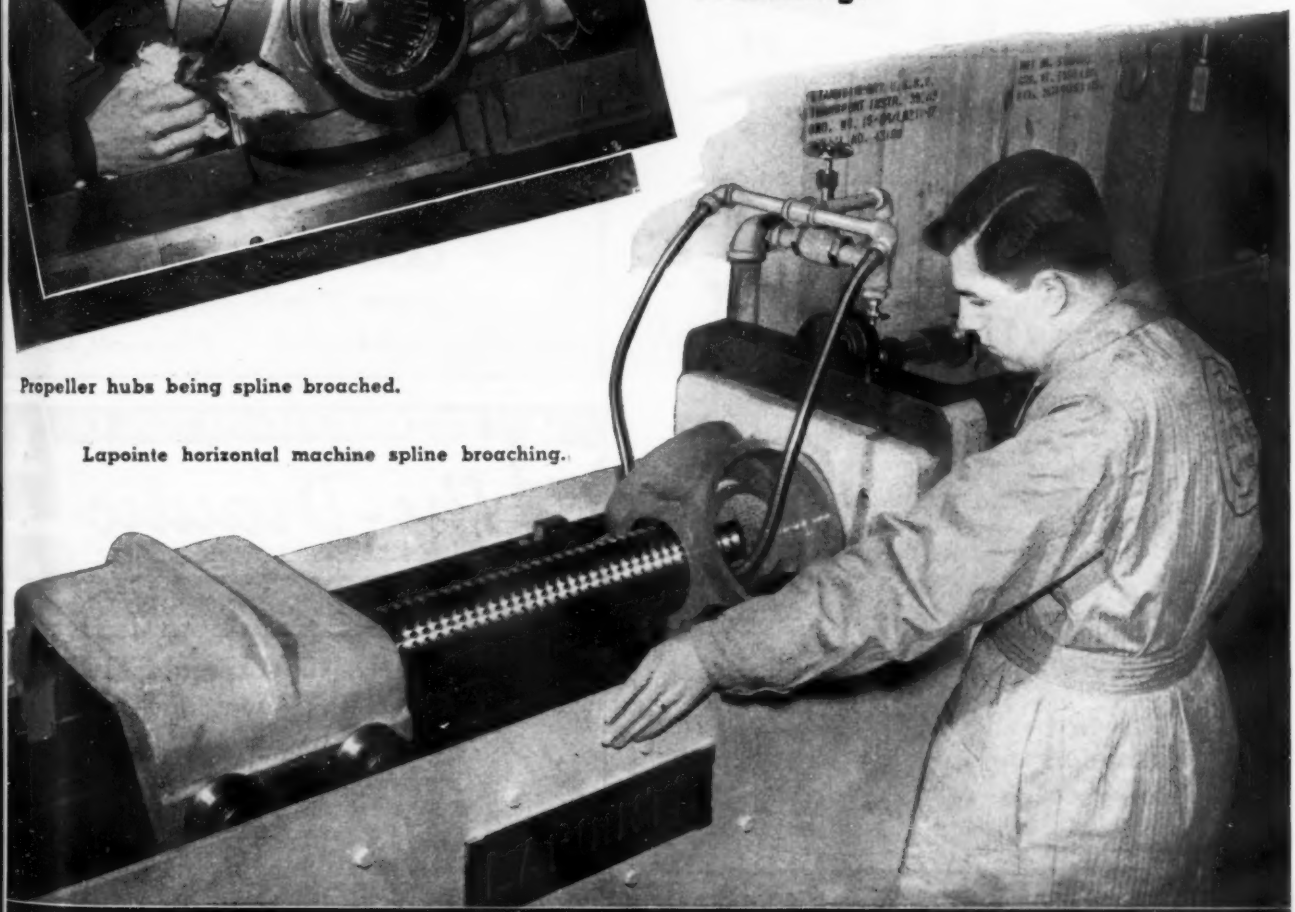
Propeller hubs being spline broached.

Only by broaching can these propeller hubs be made by a single operator at one time on one machine. This is but one of the advances that Lapointe has added to modern machine production by broaching.



Lapointe horizontal machine spline broaching.

The LAPOINTE MACHINE TOOL CO.

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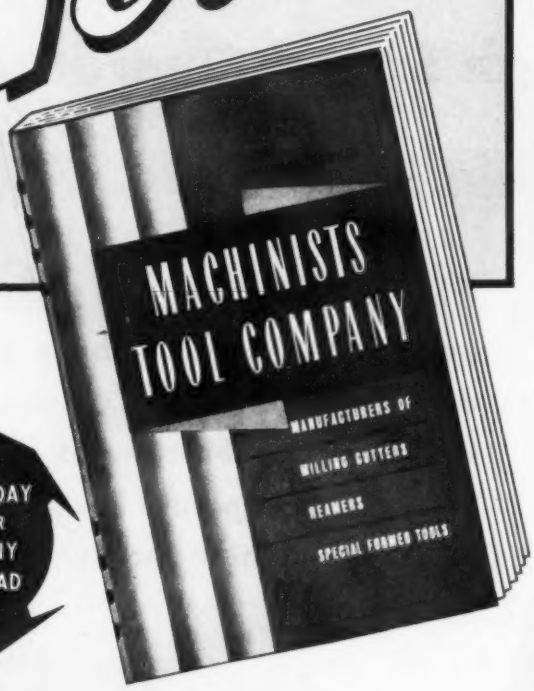

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The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units, so that repairs can be made easily.

There is a R. & S. Gauge for practically every purpose. Write for catalog describing our complete line.

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Makers of Dial Gauges Since 1885

REED-PRENTICE No. 5

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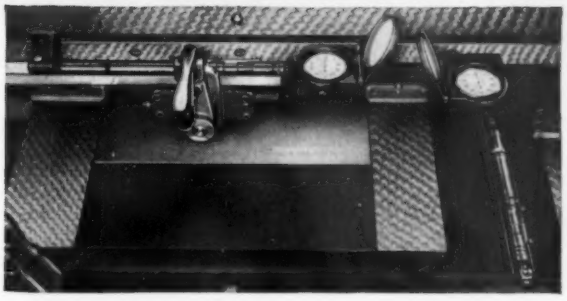
Constantly increasing production covering pool order allocations has made possible the immediate delivery of a limited number of Reed-Prentice No. 5 Milling Machines and Jig Borers. Our Sales Engineers will gladly consult with you relative to the Reed-Prentice line of Machine Tools.

for MILLING ★ ★ ★ JIG BORING

The Reed-Prentice No. 5 Vertical Milling Machine is a fast, rugged, accurate, and efficient miller which will fulfill your most exacting requirements. Used as a die-sinker it is especially efficient in the making of drop-forging and die-casting dies.

SPECIFICATIONS

Longitudinal power feed	48"
Cross power feed	16"
Table working surface	60" x 16"
Vertical adjustment head on column	15"
Vertical feed of spindle	9"



The No. 5 Jig Borer is equipped with precision measuring devices (as shown above) for extremely accurate operations on jigs and fixtures.

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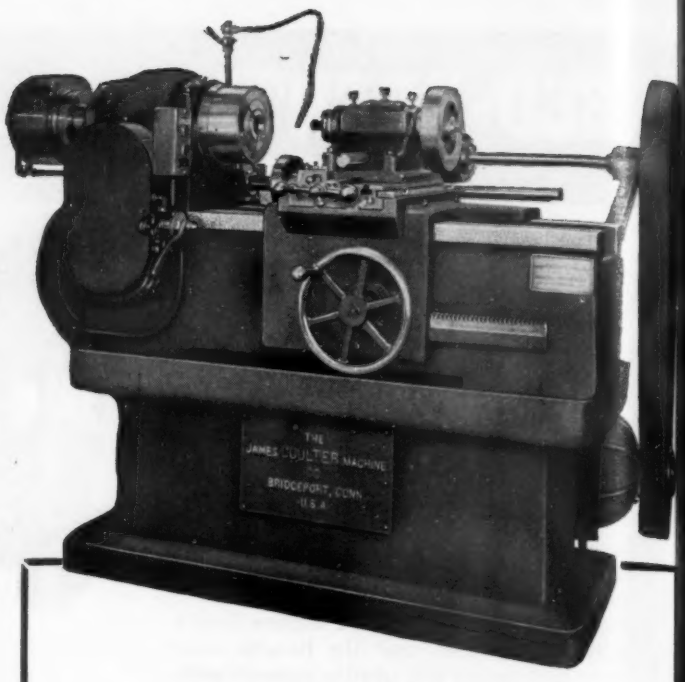
Keep Ahead of DEFENSE DEMANDS on the PRODUCTION of EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

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BRIDGEPORT • CONNECTICUT • U.S.A.

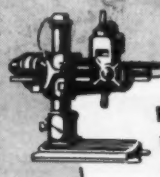
a new name
a better tool

benchmaster—the new name for quality bench machine tools—presents an improved vertical milling machine with horizontal milling attachment.

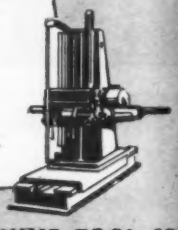
Table size—6"x14" • No. 2 Morse Taper Spindle • Spindle Speed—450, 2100 R P M • **Vertical mill** (less motor) **$310 FOB Factory Horizontal Head** (optional) **$75.**

benchmaster tools — manufacturing company
2952 w. pico, los angeles, calif.
formerly Duro Mfg. Co. of Los Angeles

GILBERT



PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

KNIGHT
VERSATILE MILLERS
ACCURATE • RIGID

FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE
W. B. KNIGHT MACHINERY CO.
ST. LOUIS MISSOURI

DAVIS KEYSEATER

This low cost machine will handle any keyseating job in the shop up to 1 ¼ in.

Write for illustrated bulletin

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

Liberty Planers

48" x 48"
Double Housing
Medium Duty

QUICK DELIVERY

Consult Liberty as to number of this size and type of planer available for prompt delivery and proposed shipping dates.

● Here is a sturdy, rugged machine designed and developed for efficient, economical operation on medium class planer work.

These are just a few of the important features of this Liberty which provide you with high accurate production.

Box type table with "T" slots machined from solid extra heavy box type housings, bolted and doweled to bed.

Sturdy cross brace at top assures sustained rigidity. Deep box type cross rail individually motorized for elevating.

Friction feed and rapid traversing mechanisms for rail head are immersed in oil—located at end of rail along with simplified control.

Rail heads are provided with automatic pneumatic tool lifters.

Side heads may be moved below table level when not in use.

Driven by 30 H.P. DC variable voltage reversing motor, 40 to 1200 R.P.M. Generator set and controls operation 3 phase, 60 cycle 220 or 440 Volt current. Table feeds range from 6 to 172 F.P.M.

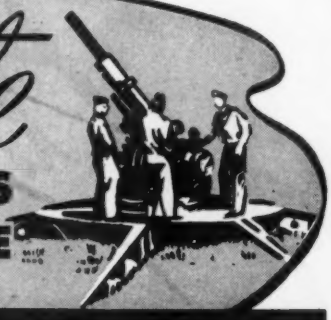
New Liberty Catalog #155 fully illustrates and describes this 48" Double Housing Planer. Your copy mailed upon request.

LIBERTY PLANERS

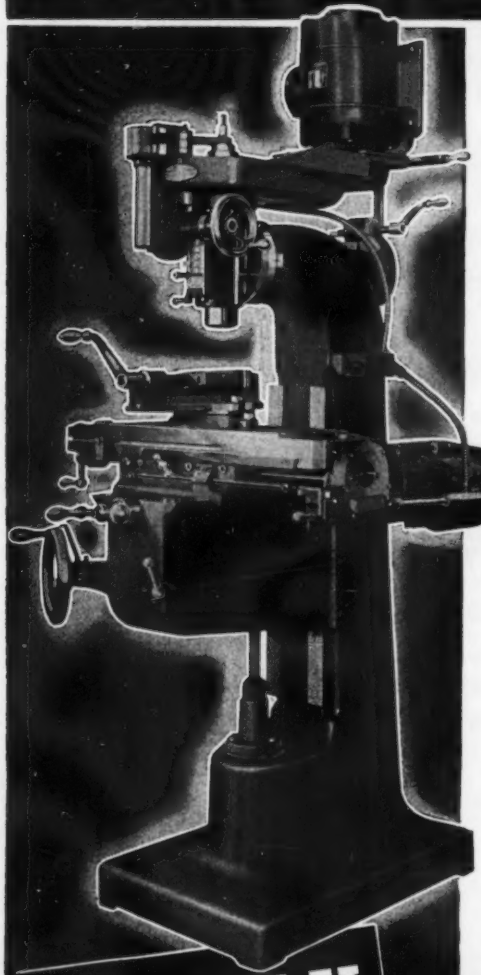
1006 WELLER AVENUE HAMILTON • OHIO

Accurate

AS THE GUNS THEY HELP PRODUCE



INDEX MILLS



Manufactured by Index Machine and Tool Co. Jackson, Michigan

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★ Precision Ball Bearing Spindle that will require no attention for two years.

★ Swivel Head which can be set 90° right or left.

★ Super construction sensitive enough to do work with end mills 1/8" diameter yet rugged enough to use 3/4" end mills taking full cuts 24 hours a day.

★ Verniers for locating, and power feed to spindle for boring.

★ A versatile machine that can be used in the tool room or on the production line.

Send inquiries for immediate quotation and quick delivery to Factory Sales and Distributing Agents.

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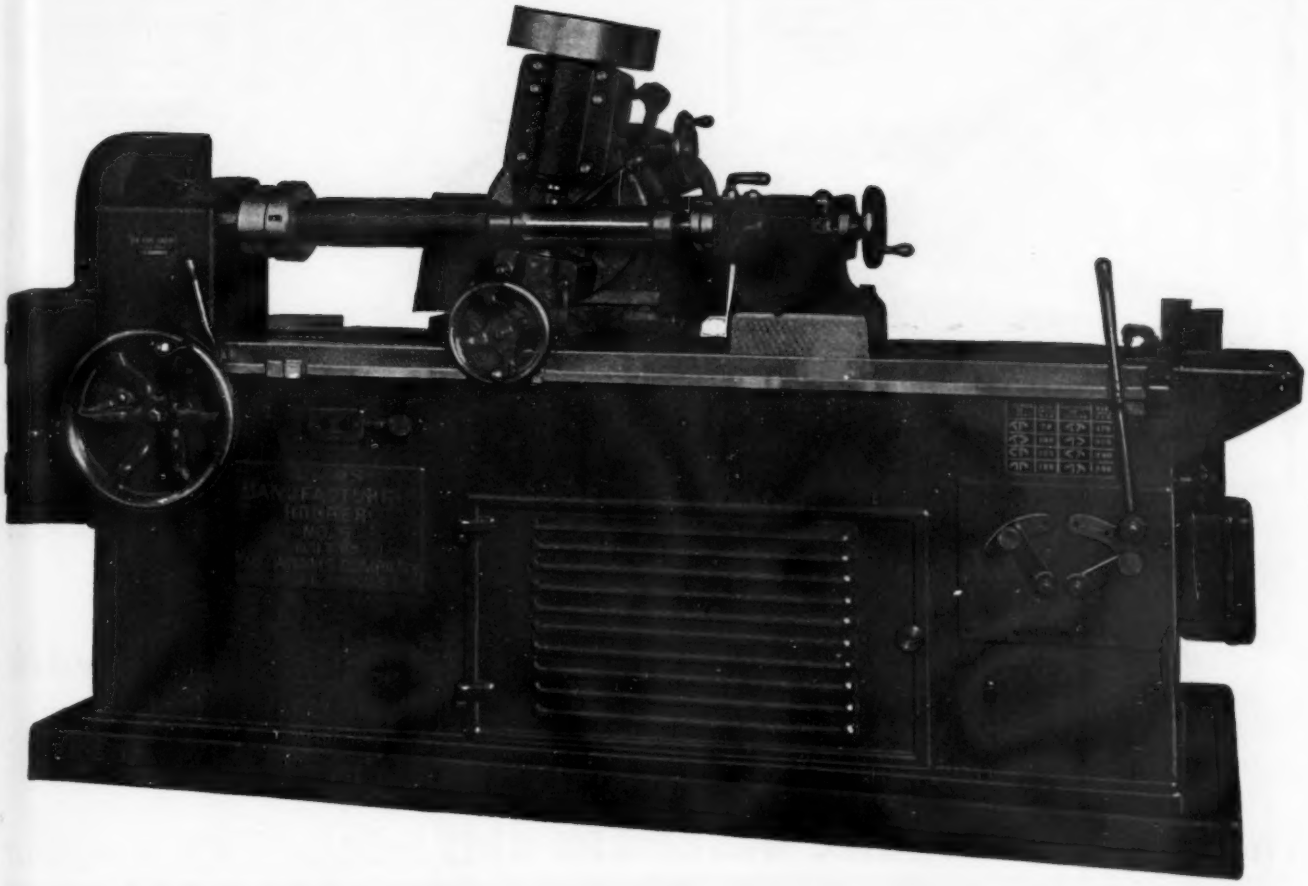


SPLINING

on the

Adams Manufacturing Hobber

The production of multiple splined shafts within close tolerances is no problem when you use the Adams Manufacturing Hobber.

This is a machine that was designed specifically for multiple splines and spur gears and which is equally effective on short runs and production lots.

Simple setups, accessibility of work and controls, and the automatic hobbing cycle make it very convenient to operate.

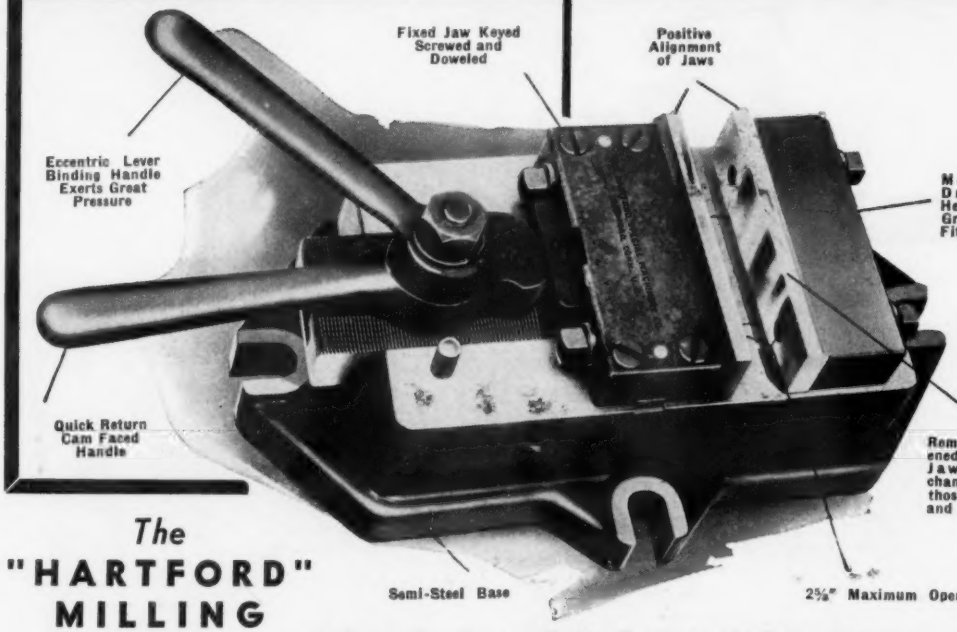
Unusually close tolerances assure correct spline fits, and the machine is so designed that the original accuracy is maintained throughout a long period of service.

Two sizes: No. 5M - 8" diameter, 48" between centers. No. 6M - 8" diameter, 24" between centers. If your work includes helical gears, worms or screws, ask for information on the Adams Gear Hobber and Thread Miller.

THE ADAMS COMPANY

1905 BRIDGE STREET
DUBUQUE, IOWA, U. S. A.

1883 — Our 60th Year — 1943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Positive Alignment of Jaws
Eccentric Lever Binding Handle Exerts Great Pressure
Movable Jaw Drop Forged Heat Treated and Ground on all Fitting Surfaces
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Removable Hardened and Ground Jaws. Interchangeable with those of No. 2B and S. Vise
Semi-Steel Base
2⅝" Maximum Opening

Specifications

Jaw width—5"
Jaw depth—1 3/16"
Max. opening
(Plain Jaw)
Jaws in place—2⅝"
Jaws removed—3½"
Max. opening
(Swivel Jaw)
Jaws in place—2¼"
Weight 40#
Length—13"
Width—8"
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The "HARTFORD" MILLING VISE . . . *ideal for high production munitions work*

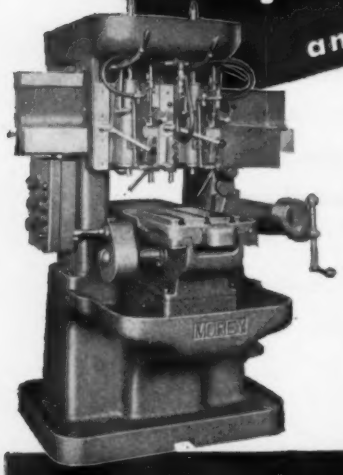
Quick action and tremendous holding power—with all operations easily and conveniently handled by two levers—makes the "HARTFORD" the vise for today's requirements. Lower cam faced lever provides quick opening; upper eccentric lever exerts pressure for work holding. Reliese of top lever and a quarter turn of lower one provides means of opening jaws instantly for chip clearance of change of work.

MADE IN PLAIN AND SWIVEL JAW TYPE

The HARTFORD SPECIAL MACHINERY CO., *Hartford, Connecticut*

Preloaded Precision Bearings for Spindles

MOREY 12M HIGH-SPEED VERTICAL PROFILER and MILLER



Two spindle or single spindle

Speed and more speed in the production of interchangeable parts requiring milling of any contour or outline is yours in the MOREY 12M. Provision for increased clearance between spindles and table.

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HAMILTON
SWISS TYPE
GEAR HOBBERS

. . . for accuracy and speed in hobbing PINIONS, GEARS and SECTORS.

TWO MODELS

No. 00 SPUR GEAR HOBBER for work up to 2" dia.

No. 1 SPUR and SPIRAL GEAR HOBBER (illustrated) for work up to 8" dia.

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TRIPLEX MACHINE TOOL CORP.
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HAMILTON TOOL CO., *Builders*
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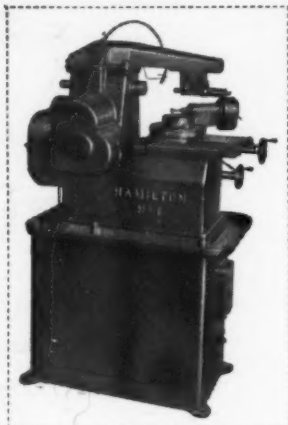

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For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

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5 in., 6 in. and 7 in. sizes
All parts Interchangeable
JOHN B. STEVENS INC.
474 Canal St., New York, N. Y.

HOW GORTON saves time ON PROFILE MILLING WITH SEMI-SKILLED OPERATOR

GORTON
RACINE, WIS., U.S.A.

GORTON

9-J Super-Speed Vertical Mill with Duplicator Table and Tracer Profiles Crankshaft Part in 15 Minutes Floor-to-Floor Time

• This prominent airplane engine manufacturer (name on request) utilizes semi-skilled help for operating Gorton Super-Speed Milling Machines and Duplicators. The operation being performed is *Profile Milling of a .738" Radius on the Rear Section of a Steel Crankshaft.* Feed is by hand, spindle speed is 500 r.p.m. using a special .738" diameter four-fluted ball cutter. (This cutter is ground on a Gorton 375-2 Cutter Grinder.)

This is an excellent example of the ease of operation of Gorton High-Speed Millers and Duplicators in performing unusual operations.

AN EASTERN MANUFACTURER OF TOOLS AND DIES WRITES: "... MOST IMPORTANT TODAY IS THE FACT THAT WE CAN USE WOMEN TO OPERATE THESE MACHINES."

These are but two of many ways in which Gorton Super-Speed Milling Machines are saving vital man hours on form milling. Perhaps you, too, can save additional hours on your present or new milling equipment. Gorton Engineers, specialists in Vertical High-Speed Milling, will be glad to make recommendations on your work—without obligation.

SUPER-SPEED MILLING DATA

OPERATION—Profile Mill .738" Radius.

MACHINE—Gorton 9-J Super-Speed Vertical Mill with Duplicator Table and Tracer.

PART—Rear of Crankshaft—Steel.

CUTTERS—Special .738" dia. Ball Cutter—Profile Form Type—4 Flute

HOLDING—Special Fixture.

FEED—Hand.

SPINDLE SPEED—500 r.p.m.

STOCK REMOVED—1/8".

FLOOR-TO-FLOOR TIME—15 Minutes.

FREE

Additional data and specifications are included in this booklet. Write for your copy today. Ask for Catalog No. 1400-B.

GEORGE GORTON MACHINE CO.

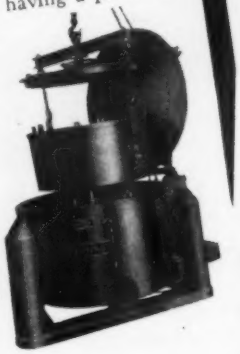
1315 RACINE STREET, RACINE, WISCONSIN, U.S.A.

SPECIALISTS IN ENGRAVING, DIE MAKING AND SUPER-SPEED VERTICAL MILLING

Stop throwing away CUTTING OIL!

Now is the time to conserve cutting oil hidden in your chips. Tolhurst Chip Wringers recover as much as 98.6% of this valuable oil through the application of centrifugal force only. Routine is simple. Unskilled help can operate Tolhurst Chip Wringers.

REDUCE TOOL WEAR — The effect of having a plentiful daily supply of reclaimed oil results in a more generous and conscientious use of cutting oil . . . customer tool room records show that tool wear is often reduced as much as 50% after Tolhurst Chip Wringers are put into action. Investigate Tolhurst Chip Wringers for conserving cutting oil and reducing tool wear. Details on request.



Division of American Machine and Metals, Inc., East Moline, Illinois

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More than 2700 war plants now use thousands of TRICO MICRO-CHEKS to speed up the gaging of millions of precision parts. With it, inexperienced workers quickly become dependable inspectors. Our new booklet shows many further uses of this accurate, speedier gage. Write for this timely information.

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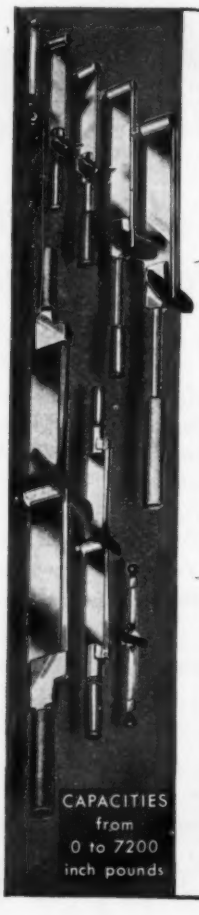
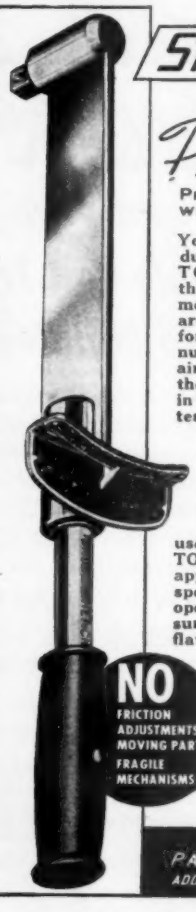


CAPACITIES from 0 to 7200 inch pounds



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Protect your products with MEASURED torque

You too can protect production with STURTEVANT TORQUE WRENCHES — the permanently accurate measuring wrenches which are used to assure the uniform tightening of screws, nuts and bolts, in most aircraft engines, to control the "set" of threaded parts in delicate instruments, to test the frictional drag in giant diesels — for controlled uniformity in assembling, for rapid inspection . . . for testing, gauging, measuring torque.

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NO FRICTION ADJUSTMENTS MOVING PARTS FRAGILE MECHANISMS

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SNYDER

AUTOMATIC "SPECIAL" for milling binder bar slots in aircraft cylinder heads

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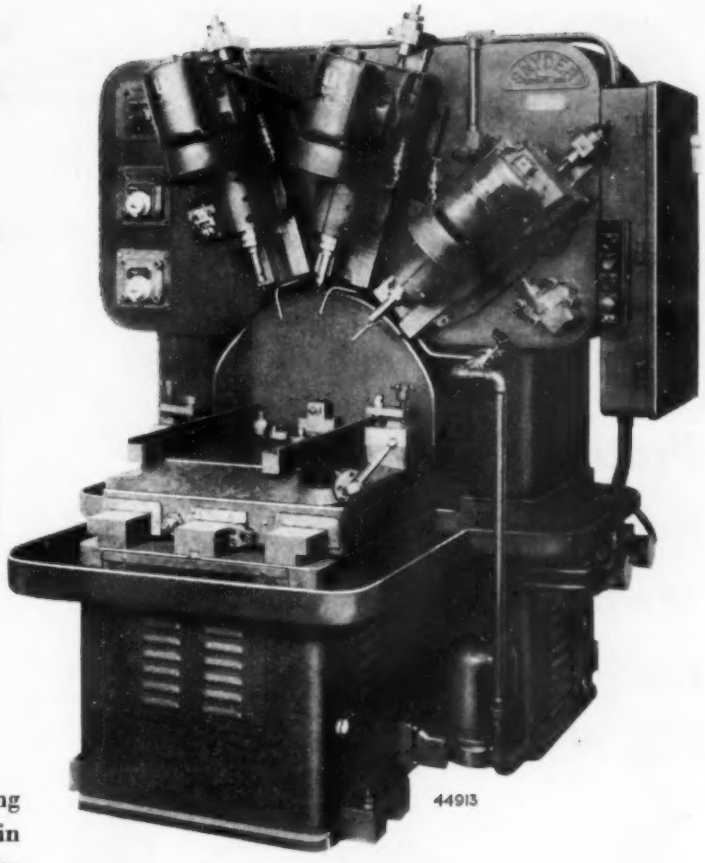

This machine was developed for milling slots for binder bars angularly placed in three fin sections of forged aircraft cylinder heads.

The tool spindles are of high speed, precision, ball-bearing type, driven by V belts from individual, dynamically balanced spindle motors. Each spindle is controlled by an individual hydraulic cycle and all three are geared for simultaneous operation.

The tools are double-end, straight shank end mills with adjustment for cutter wear by means of micrometer screws.

The part is located on a master locating plate which is clamped on the fixture table manually. When the cycle starter button is pressed, the three tools advance into the work to the full depth of the cut.

At this point the table automatically moves forward and feeds the work against the cutters for the entire length of the cut. At the end of this cut, the table stops, the cutters retract and the cycle is complete.

When the next part is placed on the table, the operation is repeated. This time, the table automatically moves backward for the lengthwise cut, returning to its original position and thus eliminating the need for resetting the table after each cycle.

The fixture is hydraulically operated for the feed stroke and rides on hardened and ground ways with a heavy center guide. The three controls shown on the column control the cycle for the infeed of the tools and the forward and backward feed movement of the fixture table.

If your post-war planning calls for high production at low unit cost, we invite your inquiries as to what Snyder special and standard machines can do for you.

SNYDER TOOL & ENGINEERING CO.
3400 E. Lafayette Ave. • Detroit 7

designers and builders of machinery for HIGH *production at* LOW *unit cost*

Producing stamped parts Faster - Better Cheaper

Precision Instrument Stampings made complete per stroke on H&W Dieing Machines

Airplane fuselage hinge of duralumin produced complete per stroke in continuous strip to precision limits including BROACHING operation.

Airplane strut seat of .031" brass produced complete one per stroke at new high rate.

Machine gun belt link produced complete one per stroke to extreme precision limits at exceptionally high speed.

Where accuracy of stamped product is of paramount importance. Dieing Machines are able to satisfy the requirements, and at the same time give high production COMPLETE PER STROKE. Many of the stampings produced on this unique automatic press go into airplane instruments and small motor-driven controls. Produced often to precision within .0002" limits, these parts may involve 6 to 8 or more operations, including blanking, piercing, forming, coining, drawing, broaching, extruding in the same piece. The potentialities of the Dieing Machine are enormous, for both wartime and peace time production.

Capacities 10 tons to 300 tons.

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STAMPINGS

- Machine gun belt links
- Mechanical time and contact fuze parts
- Rifle components
- Carriage clips or rifle chargers
- Gas mask stampings
- Bomb components
- Shell parts
- Detonator stampings
- Airplane instrument, fuselage and engine parts

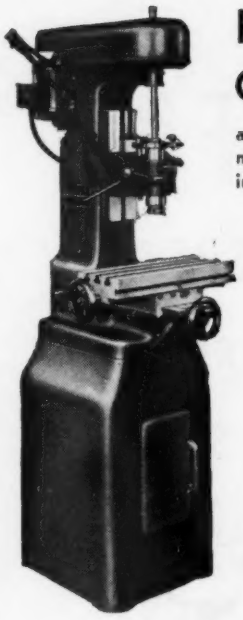
OPERATIONS

- Bullet assembling
- Primer inserting
- Automatic time and contact fuze assemblies

THE HENRY & WRIGHT MFG. CO.

467 Windsor St. Hartford, Conn.

Henry & Wright Dieing Machines



FAST *Set-up*, PLUS QUICK *Changeover*

are machine features which every tool room needs to handle the continuous run of small important jobs that can't wait.

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HIGH SPEED VERTICAL

MILLING and JIG BORING MACHINE

is the answer to speed demands, versatility, accuracy and economy in a wide variety of die work, jig making, metal patterns, models, drilling, milling and reaming.

Eight spingle speeds—"a speed for every need."

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LINLEY BROS. CO., Bridgeport, Conn.

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FOR

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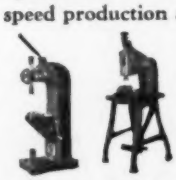
Famco's exclusive front and side gib plate adjustments compensate for wear, eliminate "shimmy," and assure perfect ram alignment at all times. As in the above operation at the Mall Tool Company, Famco Presses speed production and increase precision. Famco builds 32 stock sizes of bench and floor model Arbor Presses . . . ½ to 15 tons pressure; and 10 sizes of Foot Presses, bench and stand mounted types. Write for details.



Floor Type Arbor Press No. 15 Foot Press

FAMCO MACHINE CO.

1316 18th St., Racine, Wis.

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DRIVING *Millions* OF RIVETS TO MAKE AMERICA STRONG!

In using RIV-N-JECTORS, the operator can either drive with one hand, or she can steady the riveter hand while comfortably holding the RIV-N-JECTOR.

★ The Hitler-Mussolini-Hirohito gang will get little comfort out of the latest developments on the Cleco front. For, to a hustling line of slow and fast-hitting riveters, plus an impressive assortment of squeezers, plus the famous Cleco sheetholders, now have been added RIV-N-JECTORS, ingenious magazine-equipped gadgets that save 90% of the rivets usually dropped in the riveting process.

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For fast, efficient riveting with minimum waste, write today for the complete story on these Cleco products.

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Here's Help
FOR FASTER RIVETING

Cleco **RIVETERS**
Bulletin 85

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Bulletin 89

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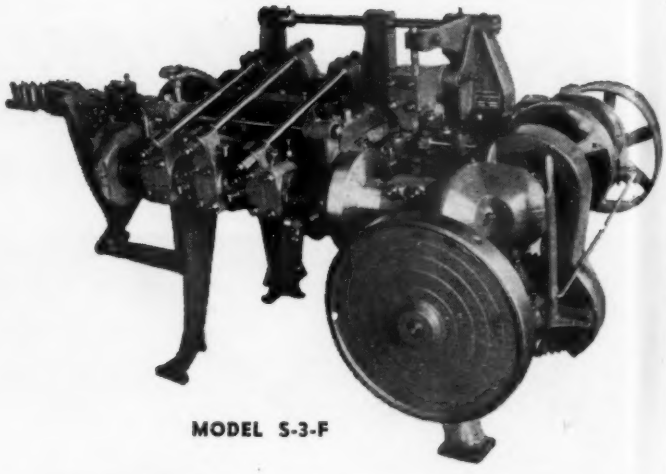
STEP UP PRODUCTION OF FORMED PARTS



MODEL S-3-F

. . . *with the*

NILSON AUTOMATIC METAL and WIRE FORMING MACHINES

Today's requirements for higher efficiency, greater speed and products of greater uniformity and accuracy are met in the new NILSON RIBBON STOCK FORMING MACHINES. These machines are the achievement of over fifty years accumulated experience in designing and building metal forming machines. Careful selection of materials and skilled workmanship result in machines that are famous for long life and low maintenance.

FEATURES THAT CONTRIBUTE TO BETTER, FASTER WORK

Superior features of the NILSON four-slide forming machines are the result of long experience and include:

. . . open construction of press and forming tools.
. . . patented slide feed which has an independent cam-operated wire gripping device.
. . . transmission of power operating wire feed through a straight line.

Send for 4-page circular giving further information as well as detailed specifications of sizes and capacities.

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We have been engaged in the design and production of special automatic machinery of high production capacity for over thirty years. We are prepared to render a complete service in connection with the design and production of automatic machinery of every description. Consult Nilson on your requirements.

THE A. H. NILSON MACHINE CO... *Bridgeport, Conn., U.S.A.*

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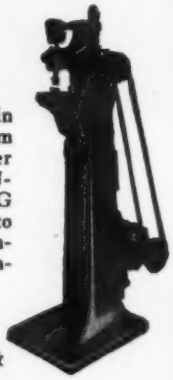

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PRESSES
FEEDS
AUTOMATIC EQUIPMENT
THE V & O Press Co., Inc.
HUDSON, N. Y.

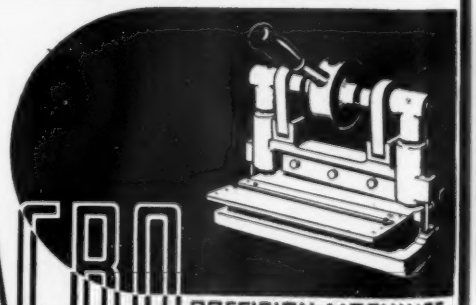
SOLVE YOUR "SHORT RUN" DIE PROBLEMS

"Extra Special Rush! Speed it up! When can you deliver?" Maybe you don't have to wait — Wait — WAIT — for dies! Try "DIE-LESS DUPLICATING" with Di-Acro Shears, Brakes, Benders. These are *precision* machines — all duplicated work is accurate to .001". You'll get a new slant on "short-run" production problems from the great variety of parts which can be produced by Di-Acro Machines. Thousands of them are in use saving Man Hours and Critical Materials.

SEND TODAY FOR CATALOG
"METAL DUPLICATING WITHOUT DIES"

It's an eye-opener on what you can do *without* dies, shows typical parts, and gives sizes and capacities of all models of Di-Acro Shears, Brakes, Benders.

with

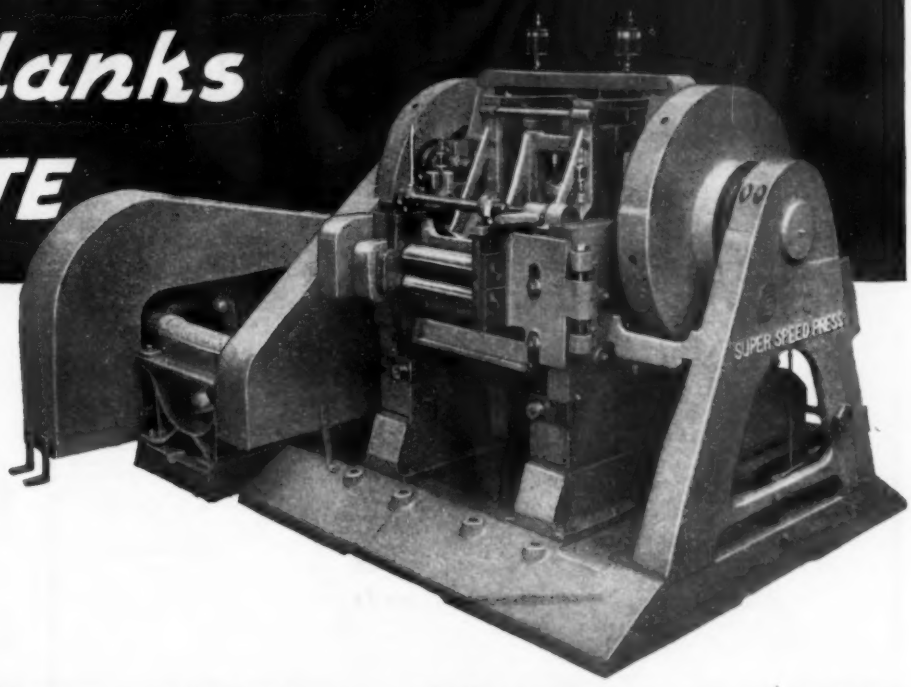


DI-ACRO PRECISION MACHINES

SHEAR (illustrated) • BRAKES • BENDERS

O'NEIL-IRWIN DI-ACRO PRECISION MACHINES MFG. CO. 311 EIGHTH AVE. SO. MINNEAPOLIS, 15, MINN.

With ONE die— 1000 blanks a MINUTE



Small Parts — 2 to 10 Pieces Per Stroke Production as High as 10,000 Parts Per Minute

FERRACUTE SUPER SPEED PUNCH PRESS

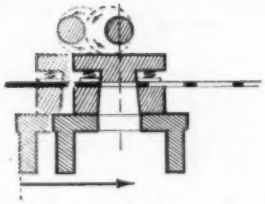
A NEW OPERATING PRINCIPLE— CONTINUOUS CYCLE OF OPERATION

A mechanical principle new in press and stamping operation gives the FERRACUTE SUPER SPEED PUNCHING PRESS its high speeds and power beyond its apparent capacity.

The die bed of the SUPER SPEED PRESS reciprocates in a horizontal plane, the amount of travel approximating the amount of feed per piece. The punch member takes its motion directly from the crankshaft, the amount of stroke being adjustable. This rotary motion of the punch face coincides at its lower arc with the reciprocating die on its forward stroke. Gripped by the stripper, the material is held between the punch and die, the whole traveling forward horizontally as the punch penetrates the work, passes the center point and withdraws from the work, the stripper clearing the punch.

The material is fed forward by feed rolls controlled directly from the crankshaft through a variable speed drive. When less than ⅜" feed is required, no feed rolls necessary. There is no lost motion in recovery, no pause or dwell of the punch, no toggle motions or knuckle joints. THE FERRACUTE SUPER SPEED PUNCH PRESS feeds itself with a synchronized motion that definitely assists high production speed.

The FERRACUTE SUPER-SPEED PUNCH PRESS is built to the same high standards of materials and workmanship that have made Ferracute Presses famous.



Punch and die travel with material

PRODUCTION ECONOMIES

1. Uses your present or any standard dies, compound or progressive.
2. Takes no longer to change dies than conventional presses—thus adaptable to long or short runs.
3. Die life increased and regrinding expense reduced 60 to 80%.
4. Accuracy in spacing continuously maintained by continuous feed.
5. Avoidable waste of coil or strip stock reduced to minimum by adjusting feed while press is in motion.
6. Internal expanding brake in each flywheel stops press instantly without shock or strain to working parts.
7. Stacking chutes for blanks can be used.

SUITABLE APPLICATIONS

Piercing • • • • • Blanking
Cut off Progressive Work • • •
Shallow Forming from coils or strip fed • • • • • • • • •

You are urged to make inquiries now because the installation of Ferracute Super Speed Presses may mean drastic changes in your production schedules and you will undoubtedly wish to use this machine in your peacetime production line as well as now.

INVESTIGATE SUPER SPEED NOW

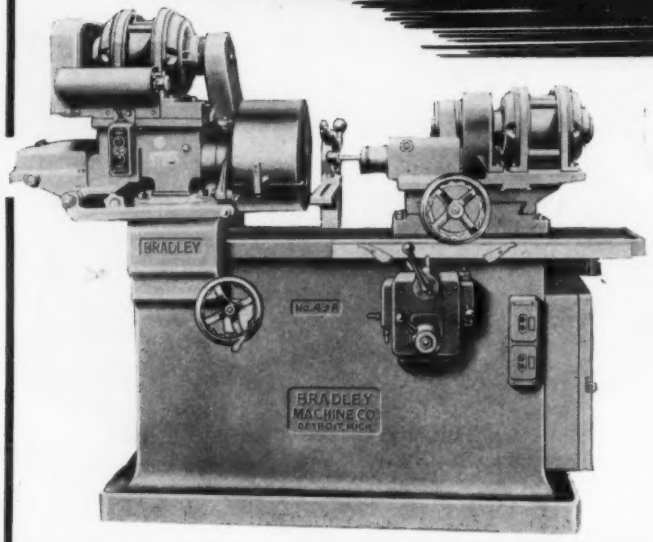
FERRACUTE MACHINE COMPANY

Super Speed Press Corporation Division

BRIDGETON, N. J., U. S. A.

THE BRADLEY . . .

HYDRAULIC INTERNAL GRINDER



PRICE
$8400.00
Complete

45 Day Delivery

Workhead bearings	Timken Precision Taper Roller
Wheelhead Spindle	Parker - 44A
Hydraulic Unit	Vickers
Motors	Westinghouse
Electrical Equipment	Allen-Bradley
Coolant Pump	¼ HP Gray-Mills

SPECIFICATIONS

Length and width of base on floor	84"x28"
Ways	72" long
Swing over table	20½"
Swing inside standard water guard	12½"
Standard face plate	12"
Maximum diameter of hole that may be ground	18"
Maximum length of hole that may be ground	16"
Stroke of wheel head	24"
Lengthwise adjustment of cross-slide on table	12"
Taper, maximum included angles	0 to 60 degrees dependent on nature of work
Center of spindle from floor	50"
Hole thru work head spindle	1¼"
Workhead speeds adjustable from	A.C. 75-112-150-225 R.P.M. D.C. 85 to 210 R.P.M.
Wheelhead speeds adjustable A.C. or D.C.	3,600-5,000-7,000-10,000 R.P.M.
Table speeds unlimited between 0-30 feet per minute	
Cross dial graduations represent .0002	
Workhead motor	1-1½-2-3 tapered H.P. A.C. 600-900-1200-1800 R.P.M. 2-3 tapered H.P. D.C. 690-1700 R.P.M.
Wheelhead motor	5 H.P.-A.C. or D.C. 3600 R.P.M.
Hydraulic pump motor	2 H.P.A.C. or D.C. 1200 R.P.M.
Weight crated	7000 Lbs.

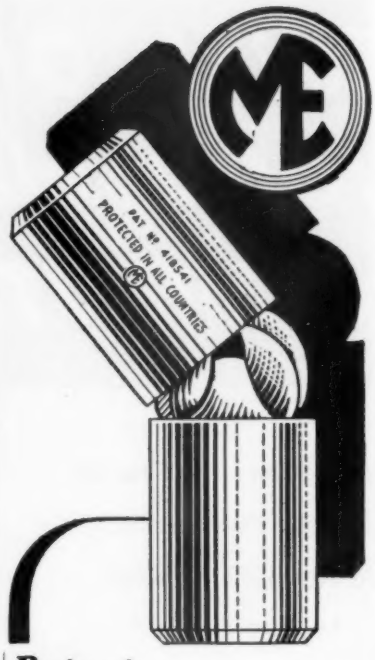
The BRADLEY Hydraulic Internal Grinder is designed to meet the majority of production and tool room grinding. This No. 43 A hydraulic internal grinder does away with the necessity for two different size internal grinders, because of the large range of work it will handle. It grinds up to 18" in diameter and 16" in length.

The auxiliary hand wheel is especially useful for facing and shoulder grinding and may be engaged or disengaged quickly. One complete turn of Hand Wheel equals only one-tenth of an inch movement of table. One easy movement of a lever gives the operator the choice of hand or hydraulic feed and neither one is dependent on the other.

SOLD BY
Bradley
MACHINERY CO.

211 JOS. CAMPAU AVE.
DETROIT, MICH.

WRITE FOR FOLDER GIVING FULL DETAILS



Patent
UNIVERSAL BALL JOINTS

- Made in a range of 9 sizes for shaft diameters ¼" to 1⅝"
- Standard Joints have maximum angle of 38° from the straight line.
- Made by the largest manufacturers of UNIVERSAL JOINTS in Great Britain.
- Widely used in Machine Tools, accessory drives and on Aircraft.
- Certified 92% to 98% efficient by the British Government's National Physical Laboratory.

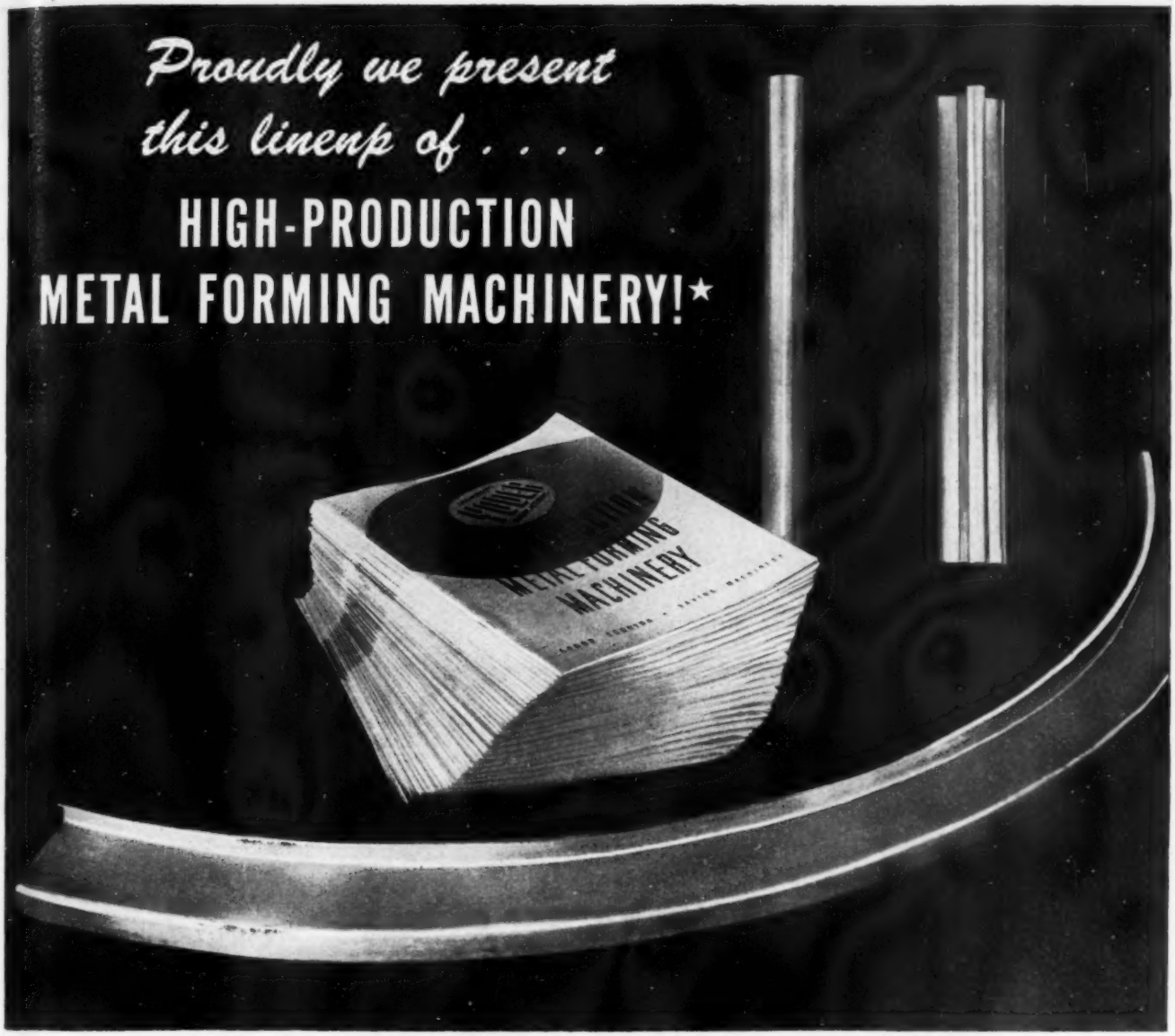
Catalogues on request.

The
MOLLART
Engineering Co., Ltd.

KINGSTON BY-PASS, SURBITON,
SURREY, ENGLAND.
Telegrams: PRECISION, SURBITON.

Proudly we present this lineup of . . . .

HIGH-PRODUCTION METAL FORMING MACHINERY!★



★ To the fabricator wanting the machines that embody the largest number of the latest in improvements in this type of equipment, we say, "You will do well to choose a 'Yoder'."

When we tell you that, "You get the improvements first from Yoder," we point with pride to our record of thirty years and more of pioneering effort.

The war emergency has placed tremendous emphasis upon high-production machinery. Yoder Equipment gives you an "up-to-dateness" that helps you to face today's and tomorrow's problems with complete confidence.

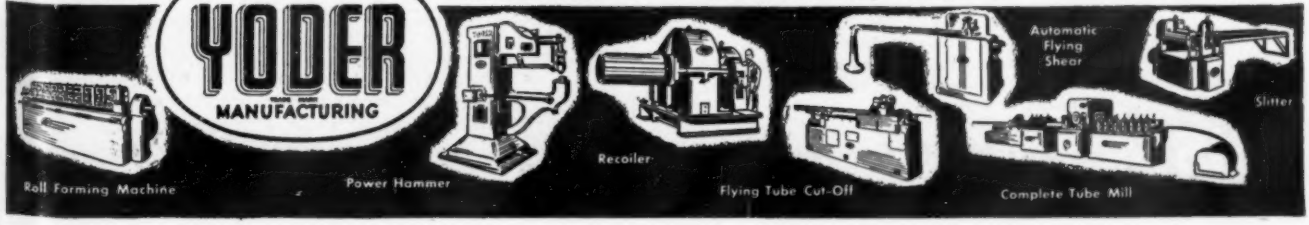
This "Yoder High-Production Metal Forming Machinery" BULLETIN is not meant to answer all of your questions—just to give to you a general idea of the things we have been designing and manufacturing. When it is roll-forming, cutting-off, edge conditioning, uncoiling, slitting, coiling, bending, leveling, and tube making, send us your sketches and a few details. We'll respond with a "proposal" including prices and recommendations. However, if your interest has not progressed to that stage, just send for the BULLETIN and we'll be glad to mail it to you immediately.

METAL • FORMING • PRODUCTION • MACHINERY

ENGINEERING **YODER** MANUFACTURING

THE YODER COMPANY

CLEVELAND, OHIO • U.S.A.



Here at last **is an OUTSTANDING high-production COLD METAL SAWING MACHINE—**

Cuts stock from 3 inches up—Handles multiple cutting of small bars or shapes . . . . . .

The outstanding high capacity and speed of this new 8" Porter-McLeod machine—for general work or for production work in single or multiple units—are attained through modern, unique features of design which assure faster, cleaner, more accurate cutting.

Upper feed of the machine permits "nesting" of economical quantities of bars or shapes using our systems of multiple or interchangeable "nests" which give support to each nest on both sides and bottom.

To insure accuracy and protect against blade damage at times when hard spots are encountered in cutting, friction disc feed is provided. Further protection is assured and weaving and buckling prevented by supporting the blade close up to its rim and by *pulling the blades upward through* the cut. This method of feed and drive also results in lower power requirements and straight cuts under all conditions.

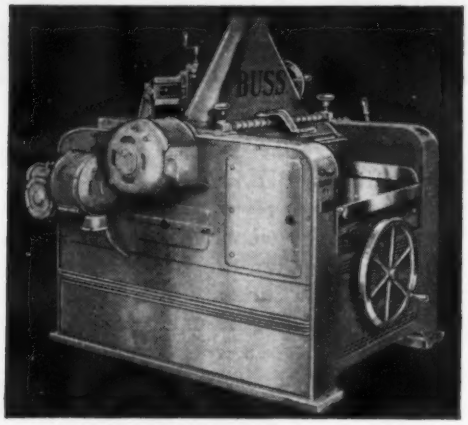
Standard feed is 3 inches per minute. This, however, can be stepped up for cutting such materials as brass or other non-ferrous metals.

Investigate the Porter-McLeod Production Cutting-Off Machine Today. Details available promptly on request.

PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASS., U. S. A.

MACHINE TOOL COMPANY

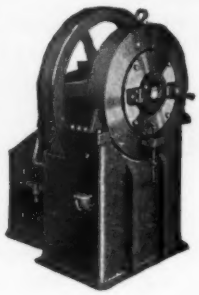
BUSS *Wood Surfacers*



GIVE YOU THE ABSOLUTE PRECISION ESSENTIAL IN PATTERN and JIG MAKING!

—plus faster change-over, greater convenience of operation and the assurance of years of perfect service. Write for Bulletins Type 4-L showing the many patented features which make this the finest of all surfacers for pattern and jig departments. Production Models to suit every circumstance. We specialize in surfacers.

BUSS MACHINE WORKS
228 Eighth St. Holland, Mich.



THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street Torrington, Conn.

Remelt and Cast Your Lead Hammers with the Field Mould and Ladle

Save time and money—keep lead hammers in good condition at all times—easy to use—fast. Made in 7 sizes for hammers from 1 to 11 lbs. Write for details.
Also, Lead Hammers sizes 1 to 15 lbs. always in stock.

JOHNSON TOOL CO., INC.
East Providence Rhode Island, U.S.A.

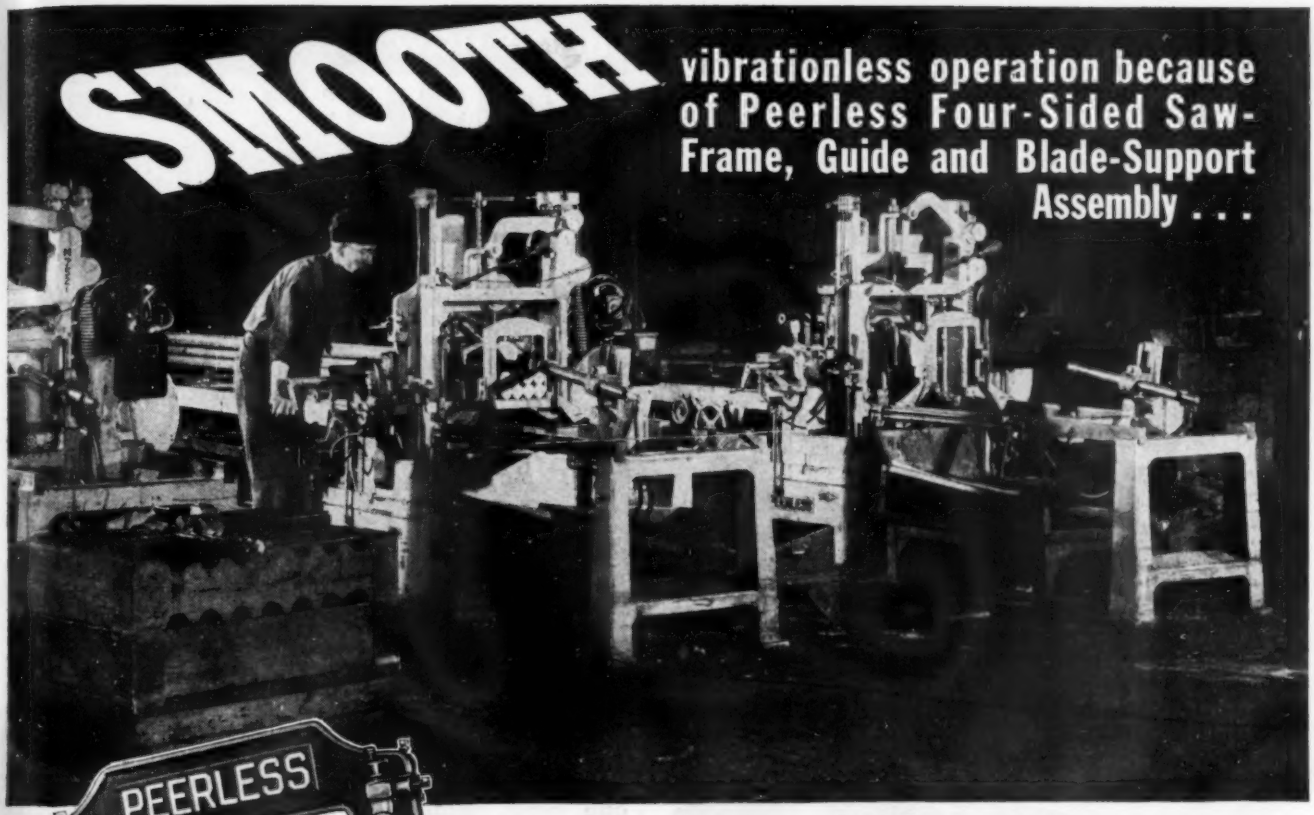
LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents Inc.

SMOOTH

vibrationless operation because of Peerless Four-Sided Saw-Frame, Guide and Blade-Support Assembly . . .



To Men Who Want to Get More Done....

You can well take a minute to check into the things that have made Peerless Metal Cutting Saws preferred for high speed precision cutting.

Close Tolerance Cutting is one. So accurately is the Peerless blade locked in place that there is no bowing or tilting under maximum tensioning. The cut is always square and true. No surface hardening or fractures. When working stainless or big billets, the saving in material is substantial. Peerless takes as little as 1/16 in. for the cut.

Speed, regardless of shape, is another advantage of Peerless. Compensating feed automatically adjusts itself to shape and size of the work — tubes or pipe are cut as smoothly as solid stock. Blade lifts clear on every return stroke; no chips to slow the cutting and dull the blade.

Smooth, vibrationless operation abolishes nerve-nagging operator fatigue and permits sawing to closer tolerance. The Peerless Four-Sided Saw-Frame assembly eliminates "chatter." Note details of its design.

You can do the job faster, with saving in manpower and at lower cost, with Peerless Metal Cutting Saws. Mail the coupon for estimate of cutting time on your toughest operation.

Only Peerless Offers All These Important Advantages . . . .

Four-Sided Saw-Frame is distortion-proof and surrounds the blade and the work. Backing-Plate Blade-Support locks the blade in place and gives rigidity to blade assembly. Eight bearings, with hardened and ground inserts, assure smooth travel of the Saw-Frame and absorb all vibration. This combination of features is found only in Peerless Metal Cutting Saws. There are many others equally interesting.

PEERLESS MACHINE COMPANY
1600 JUNCTION AVENUE • RACINE, WISCONSIN

PEERLESS MACHINE COMPANY, Dept. AM-743, Racine, Wis.
Mail cutting time estimate for.....
.....
☐ Mail catalog on Hydraulic type Saw for High Production Cutting
☐ Mail catalog covering Vertical type used for Die Block Work
☐ Mail catalog on Mechanical type Saw for production cutting
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Company.....
Individual.....
Street.....
City.....State.....

Peerless
THE ONLY METAL CUTTING SAW WITH FOUR-SIDED SAW-FRAME AND BACKING-PLATE

Fast ACCURATE *Sawing* DEMANDS PEERLESS BLADE CONTROL

BOTH VICTORS Are Winners

In your choice of hack saw blades VICTOR gives you two selections—both winners on the jobs they must tackle. For instance . . .

If your work calls for high speed sawing, select a VICTOR "Moly"*, the original molybdenum alloy blade. Its finish is gold in color. The name VICTOR is in black.

For difficult sawing jobs, your choice should be the VICTOR Unbreakable Special Flexible blade. This all-over black blade cuts like an all-hard. Its flexibility eliminates breakage and tooth strippage. Look for the word VICTOR in yellow.

For power sawing as well as hand operation, there are VICTOR Blades combining flexibility and long, useful life. Back these winners in your War for Victory.

★ *Buy U. S. War Bonds* ★

Victor

*T. M. Reg.—Blades bearing the name "Moly" are made only by Victor Saw Works, Inc., and affiliated companies.

VICTOR
SAW WORKS, Inc.
MIDDLETOWN · NEW YORK
Manufacturers of Hack Saw Blades, Frames and Band Saws

4026

HERE'S HOW
PORTER-CABLE
Abrasive-Belt SURFACER

Slashes

★ MACHINING **TIME**

★ MACHINING **COSTS**

★ MACHINING **HOLD-UPS**

The Porter-Cable Abrasive Belt Surfacer illustrated, working for a leading Eastern aviation manufacturer, faces the six bosses on the plate in one operation. The annular surface on the other side is then finished dead flat and glass smooth on one presentation to the belt, while being held in the hand fixture shown. Just one more instance of the big time-savings being achieved by this newer and better surfacing method —sometimes as much as 10 times faster than customary machining operations.

On any material—hard or soft metals, compositions, rubber, plastics, wood—this extremely adaptable Porter-Cable Abrasive Belt Surfacer takes the place of milling, grinding, planing, shaping. Its efficiency has been proved by hundreds of "hard jobs" in exacting war production.

2,500 persons crowded the Porter-Cable booth at Tool Engineers Exhibition held in Milwaukee last March, to witness demonstrations of Wet-Belt Surfacing on actual production pieces brought by the shop men themselves.

WORTH LOOKING INTO!

First, write for our new explanatory booklet. Then note that our engineering service is available to production men for study of possible adaptations of Wet or Dry Belt Surfacing, and to present users who want to broaden the use of this modern precision machine tool to its full possibilities. Send us your samples, and advise us of your problems.

Porter-Cable Machine Co.
1725-7 N. Salina St., Syracuse, N. Y.

FIRST OF THE TOOLS THAT SHAPE WAR'S WEAPONS

CABLE ADDRESS "ATKINSAW"

GENERAL OFFICES AND FACTORY
INDIANAPOLIS IND U S A
IN CANADA
SHURLY DIETRICH-ATKINS CO LTD
GALT ONTARIO
MACHINE KNIFE FACTORY
LANCASTER N Y
SALES AGENTS FOR
AUTOMATIC FILING ROOM MACHINERY

BRANCH HOUSES
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E.C. ATKINS AND COMPANY

SHEFFIELD SAW WORKS

SILVER STEEL SAWS

415 SOUTH ILLINOIS ST.

INDIANAPOLIS, IND., U.S.A.

A Report on
The Battle of Production

Gentlemen:

In almost the same sense that a private soldier is "enlisted", E. C. Atkins and Company have enlisted in World War II as a production force. Our fundamental aim is to do that in which we are thoroughly trained, at such a peak level as to aid materially the conduct of the war.

Continually, Atkins Engineers, carrying with them years of technical and practical experience, are contacting and making available their service to many concerns now engaged in the manufacture of essential war materials.

There is scarcely a weapon, machine or instrument of war whose production does not in some manner or form require the use of Saws or saw making technique. Some require numerous cutting operations. We are doing our part in keeping these Saws on the job to perform more efficiently than ever...not only to give longer service, but also to increase the speed and quality of operation. These Saws are in operation on our home fronts as well as in the bombed or transplanted factory areas of our Allies, in England and Russia.

The war attitude of E. C. Atkins and Company is one of patriotism, and we have gladly devoted our best efforts to our Country's program. Our financial resources and our organization are pledged to see it through to the only conceivable end -- Victory.

Very truly yours,
E. C. ATKINS AND COMPANY

H. C. Atkins
President

WE RESERVE THE RIGHT TO CHANGE SPECIFICATIONS PRICES & PHOTOGRAPHS AND OTHER MATTER. ALL AGREEMENTS SUBJECT TO DELAYS RESULTING FROM UNAVOIDABLE CAUSES

and FIRST IN THE PURSUITS OF PEACE

FINISHING OPERATIONS

Cost less on Haskins!

YOUR MEN work faster with easy-handling Haskins Flexible Shaft Machines. Maintenance costs are less. Machine life is longer. There are 30 different types of Haskins Equipment, each engineered to do *many* kinds of jobs. Send for Catalog 45. Shows many ways to speed production.

R. G. Haskins Company, 2760 W. Flournoy St., Chicago.

HASKINS

HASKINS *Versatile* FLEXIBLE SHAFT EQUIPMENT

USE "STREAMLINE" RULES FOR LAYOUT

Accuracy is essential on the layout table, and the construction of Master "Streamline" Steel Tape Rules assures this in the Long Island City plant of Curtis Elevator Co.

With the convex side of blade up instead of down, as with other steel tapes, the "Streamline" gives a measuring and marking edge *right on the layout* — reducing possibility of small errors.

Get a "Streamline" at your mill supply house — or mail coupon today.

Mr. Peter Mascheroni of Curtis Elevator Co. laying out work with "Streamline" Rule.

$2.65 each Complete with spare blade

Master Rule Mfg. Co., Inc.
815 E. 136th St., N. Y. C. Dept. P-7.
Please send 6-ft. "Streamline" Steel Tape Rule and Spare Blade ($2.65 enclosed)
Name_____
Address_____
City_____ State_____

Branch: 541 S. Spring St., Los Angeles, Calif.

MASTER WOOD AND TAPE RULES

CRAFTS GAGES

Carbide and Diamond-tipped GAGES AND TOOLS
GUARANTEED QUALITY

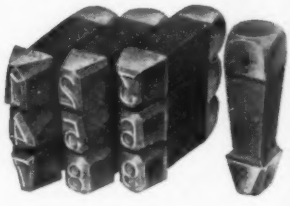
ARTHUR A. *Crafts* COMPANY, INC.
Chicago 532 COMMONWEALTH AVE. *Detroit*
Boston

SAFETY Wedge Grip LETTERS AND FIGURES

(Reg. Trade Mark)

FOR TOUGH STAMPING JOBS!

- Deeper impression with less exertion.
- Will not spall, will not mushroom
- Any size character from 1/16" to 1"



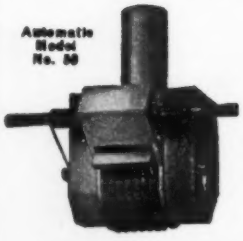
M. E. CUNNINGHAM CO.
SAFETY STEEL STAMPS
95 E. Carson St., Pittsburgh, Pa.

25% to 50% MORE SERVICE

NUMBERALL Numbering Machines

For stamping into metal etc.

Automatic Model No. 80



Non-automatic Model No. 70

Sturdy construction, precision build, perfectly aligned numbers.
All sizes of figures.
Write for Catalog.

NUMBERALL STAMP & TOOL CO., Inc.
Huguenot Park, Staten Island, N. Y.

"ROCKWELL"

HARDNESS TESTER

BETTER and BETTER EACH YEAR SINCE 1921

WILSON
MECHANICAL INSTRUMENT CO., INC.
Concord Ave. New York

FOUR BIG REASONS WHY YOU SHOULD BUY HALLOWELL WORK-BENCHES

1 You get what you want! Over 1367 "Hallowell" ready-made interchangeable bench combinations to fit practically any need.

2 You know what the cost will be! Unlike when building your own benches, there's no hit-or-miss estimating of cost.

3 You can get them quickly! Because deliveries of "Hallowell" Equipment are better than average.

4 They are a good investment! Well built for long usage. Constructed for easy movability.

• *Write for "Hallowell" Catalog Today* •

Fig. 928. "Hallowell" Work-Bench with laminated wood top. Drawer is extra. Pat'd and Pats. Pend.

"HALLOWELL" TOTE BOX TRUCKS

Displace aged, time worn method of transporting oil turnings to "Whizzer." Save almost 100% of cutting oil formerly wasted and being especially designed for the job also save labor and time.

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4 · BRANCHES: BOSTON · DETROIT · INDIANAPOLIS · CHICAGO · ST. LOUIS · SAN FRANCISCO

HOW BIG
can an Air Express shipment be?

AS TO WEIGHT, your shipment may be a pound or a ton and up, so long as it fits in a plane. **AS TO SIZE,** you will be safe in following dimensions shown underneath the illustration.

However, large shipments can often be broken into a number of smaller units. When this is impossible, consult your local Railway Express Agency, who can often make special arrangements for handling larger shipments.

FOR FASTEST DELIVERY, ship early, as soon as package is ready. PACK COMPACTLY but securely, to cut AIR EXPRESS costs.

Maximum dimensions for AIR EXPRESS *packages: Length, 35 to 49½ inches; width, 44 inches; depth, 18½ inches. Larger shipments should be broken into smaller units whenever possible to conserve valuble space.*

Air Express Speeds War Program

TODAY, AIR EXPRESS not only serves the home front but is also working hand in hand with the Army and Navy to supply our fighting fronts throughout the world.

TOMORROW, AIR EXPRESS will girdle the globe in international peacetime commerce . . . to bring *all* foreign markets to the doorstep of American business.

AIR EXPRESS
Gets there FIRST

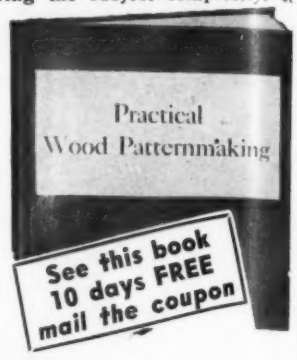
Phone RAILWAY EXPRESS AGENCY, AIR EXPRESS DIVISION
Representing the AIRLINES of the United States

WRITE for our quick-reference handbook on "How to Ship by AIR EXPRESS During Wartime." Dept. PR-2, Railway Express Agency, 230 Park Avenue, New York City.

How to make and mold any type of wood pattern

HERE is a book that provides a thorough preparation for pattern-making in the shortest possible time. Based on the author's experience of 33 years in the trade as well as in teaching, it offers a step-by-step course covering the subject completely. It explains how to read blueprints, the correct handling of tools and machines, the selection of material, the use of glue, shellac and other materials, the making of cores, core boxes, and molding. Many blueprints are included to provide ample practice material, and numerous illustrations and drawings simplify the work.

Just out!



PRACTICAL WOOD PATTERNMAKING

By J. ROBERT HALL

Instructor of Patternmaking and Foundry, Santa Monica Technical School, Santa Monica, California

186 pages, 8½x11, 325 illustrations, $3.00

THIS book offers quick and efficient training for war jobs. Everything the patternmaker needs to know is in this practical manual—

- ★ **information on tools, sandpaper, wood, and trade terms**
- ★ **explicit directions on how to carry out all types of operations, including grinding and sharpening tools, measuring lumber, gluing pattern stock, using templates, doing segment work, molding patterns with loose pieces, molding skeleton patterns, making worm-gear patterns**
- ★ **safety suggestions**
- ★ **specific drawings for the learner to work from**
- ★ **recent advances fully outlined**

Use it as a reference—you can turn quickly and easily to any particular point in patternmaking you wish to investigate—each specific subject—such as, how to prepare flake or ground glue, how to use leather fillets, how to make cores, etc.—is prepared separately in a section, numbered and indexed carefully for your *speedy reference.*

Examine it without obligation

McGRAW-HILL BOOK COMPANY, INC.
330 West 42nd Street, New York, 18, N. Y.

Send me for 10 days' examination, subject to approval or return, Hall—Practical Wood Patternmaking. At the end of 10 days I agree to pay $3.00, plus a few cents for postage and delivery, or return the book postpaid. (We pay postage on orders accompanied by remittance.)

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ETNA SPEEDS PRODUCTION OF 20 MM. SHELLS

Another **ETNA . . .**
WORKING TO HASTEN
THE DAY OF VICTORY!

ETNAS of this type are now serving in several large plants . . . helping them to produce 20 mm. shells *fast*. The operation consists of swaging a copper band around 20 mm. shells . . . an important step in the production of this vital armament. Swaging machines by ETNA do the job quickly—efficiently. Just one more of the many ways Swaging is serving in war time production.

If your operations are similar, or, if you have production problems involving sizing, tapering or reducing of round solids, investigate Swaging today! Its many uses and applications offer you a time and money saving method of turning out war work today, as well as peacetime products tomorrow.

ETNA Swaging Machines are built in capacities of 3/8" to 8"; die lengths to 18". Larger units are built to your order.

"Ask ETNA about Swaging"

THE ETNA MACHINE COMPANY
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Curtis Air Hoists and Curtis Air Cylinders are speeding production of war work, releasing skilled labor for other jobs, and reducing costs in plants all over America. Curtis Air Hoists can be operated by unskilled labor, are easily handled by women, and, because they cannot be overloaded, are practically immune to abuse.

But despite their simplicity of construction and operation, proper maintenance will help to insure and extend their unusually long life — for in many cases they may have to last for the duration.

Follow these maintenance tips, and you'll get the longest possible service from your Curtis air-powered equipment:

1. When running a new air supply line, or relocating an old one, be sure to blow out all grit, rust, and chips before connecting to the hoist.
2. Do not install hoists close to an open furnace or other source of heat without shielding, otherwise piston leather may char or lubricant dry out.
3. For smooth operation and long life, put one-half pint of heavy cylinder oil into the cylinder through the oil plug in rear head every 30 days. This keeps piston leather soft and prevents air leakage.
4. If piston jumps or jerks, it indicates improper oiling or binding of rod stuffing box. Keep stuffing box leak-tight only.
5. Fill oil cup on valve every 30 days. This admits two drops of oil every time hoist valve is operated.
6. Drain off any condensation in cylinder periodically through drain plug in lower head.
7. Check valve disc and seat occasionally to prevent wear from grit or dirt in air line. A worn valve causes "creeping" and loss of efficiency.
8. By keeping hoists and cylinders clean, properly lubricated, and by replacing broken or worn out parts now, you can increase the efficiency and long life of your equipment and prevent production shutdowns in the future.

CONSERVE METALS—BUY WAR BONDS

CURTIS PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
1924 Kienlen Avenue St. Louis, Missouri

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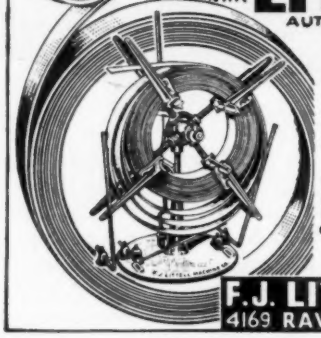
COIL STOCK FEED IT FASTER with LITTELL AUTOMATIC CENTERING REELS



REEL off your stock for faster production with LITTELL Automatic Centering Reels, for a free-flowing loop of material to presses—hand or automatic feed.

Ask about the Littell line of Reels, Feeds (Roll, Dial, Magazine, Hopper), Straightening Machines, Air-Blast Valves, Pres-Vac Safety Feeders, etc.

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Made in two sizes for shifting belts from 1" to 4" in width.

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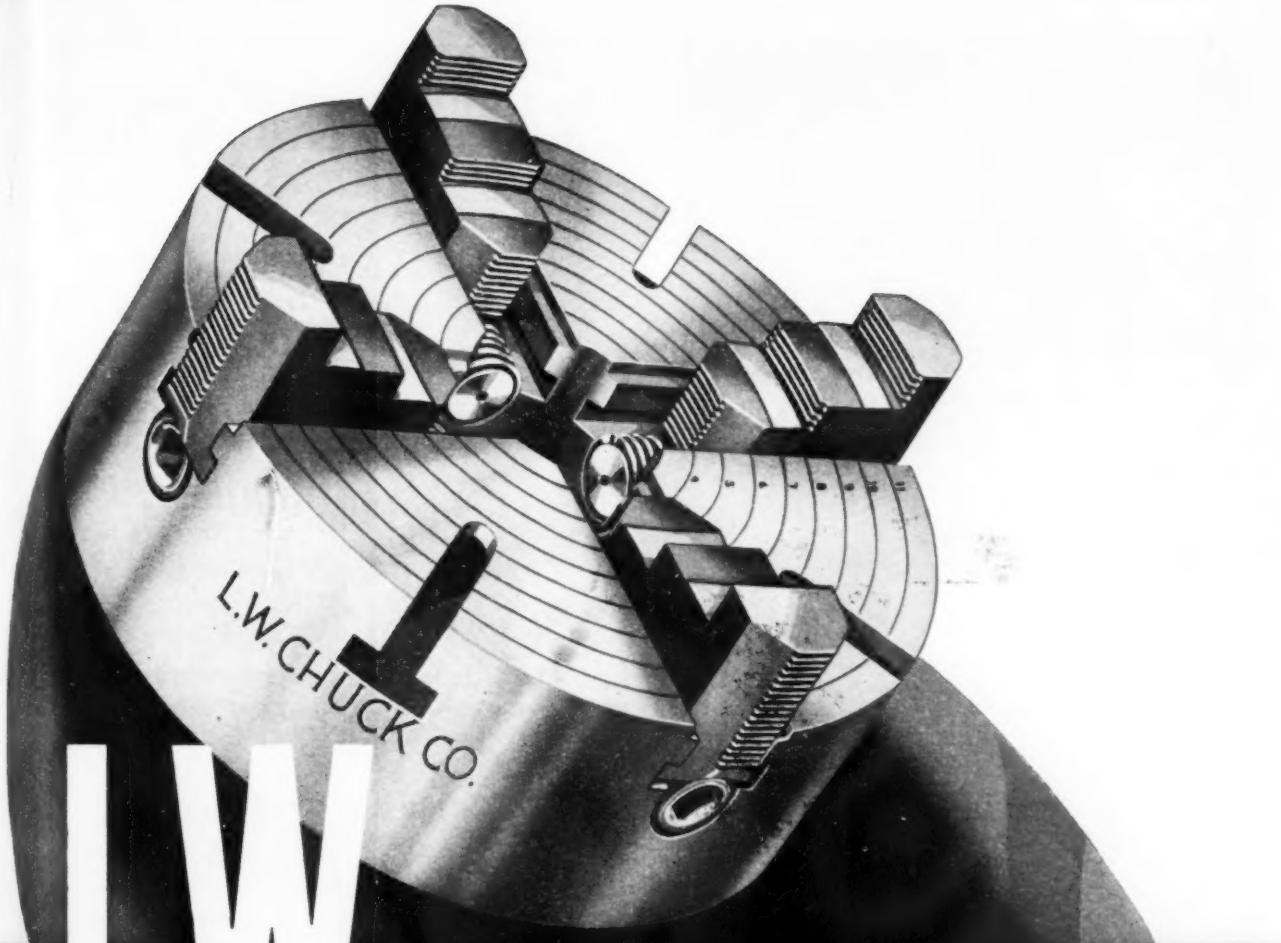

L-W LATHE CHUCKS

● Body is of semi-steel, heavily ribbed, will withstand unusual strain. Hardened steel jaws, accurately ground, have wide gripping surface. Steel thrust bearings are provided to give long wear and durability.

10″ Size	$33.45
12″ Size	38.30
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We can also supply 3 jaw Univeral chucks in the following sizes: 6¼″ — 7½″ — 10½″.

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Also Manufacturers of Magnetic Chucks • Demagnetizers Milling Machine Vises • Power Hack Saws • Dividing Heads

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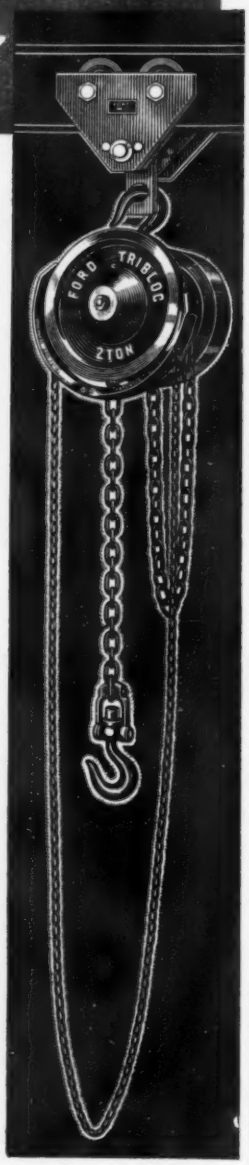
We also manufacture LATHE CHUCKS • MAGNETIC CHUCKS • DEMAGNETIZERS • MILLING MACHINE VISES • POWER HACKSAWS

The main job today is *maintenance*

...even with sturdy FORD *Triblocs*



This is no time to abuse machinery. Because steel is so critical to America now, it is up to every one of us to make our present equipment last longer. That means proper maintenance. Here are a few simple things to do to keep your FORD TRIBLOCS in efficient working order:

- Keep equipment well lubricated and in good repair.
- Don't exceed rated capacity.
- Inspect chain periodically and lubricate to avoid excessive wear.
- Don't make lifts or pulls for which hoist was not designed or intended.
- Avoid dropping hoists or throwing chain about carelessly.
- Replace hooks when showing signs of distortion from overloading.
- Be sure the hoist has the capacity and characteristics necessary for the job.
- Proper hoist selection saves production time and lengthens hoist life.

Write for information on FORD TRIBLOCS. They range in capacities from ¼ ton to 40 tons. They are available to all who have adequate priority rating.

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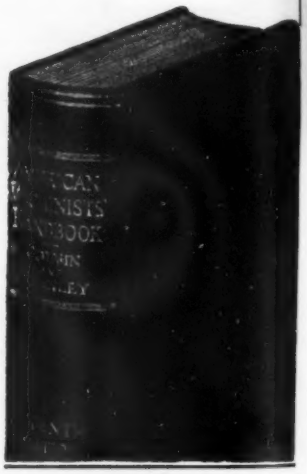

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Please send me without cost or obligation to myself, your plan by which I can profitably turn my spare time into money.

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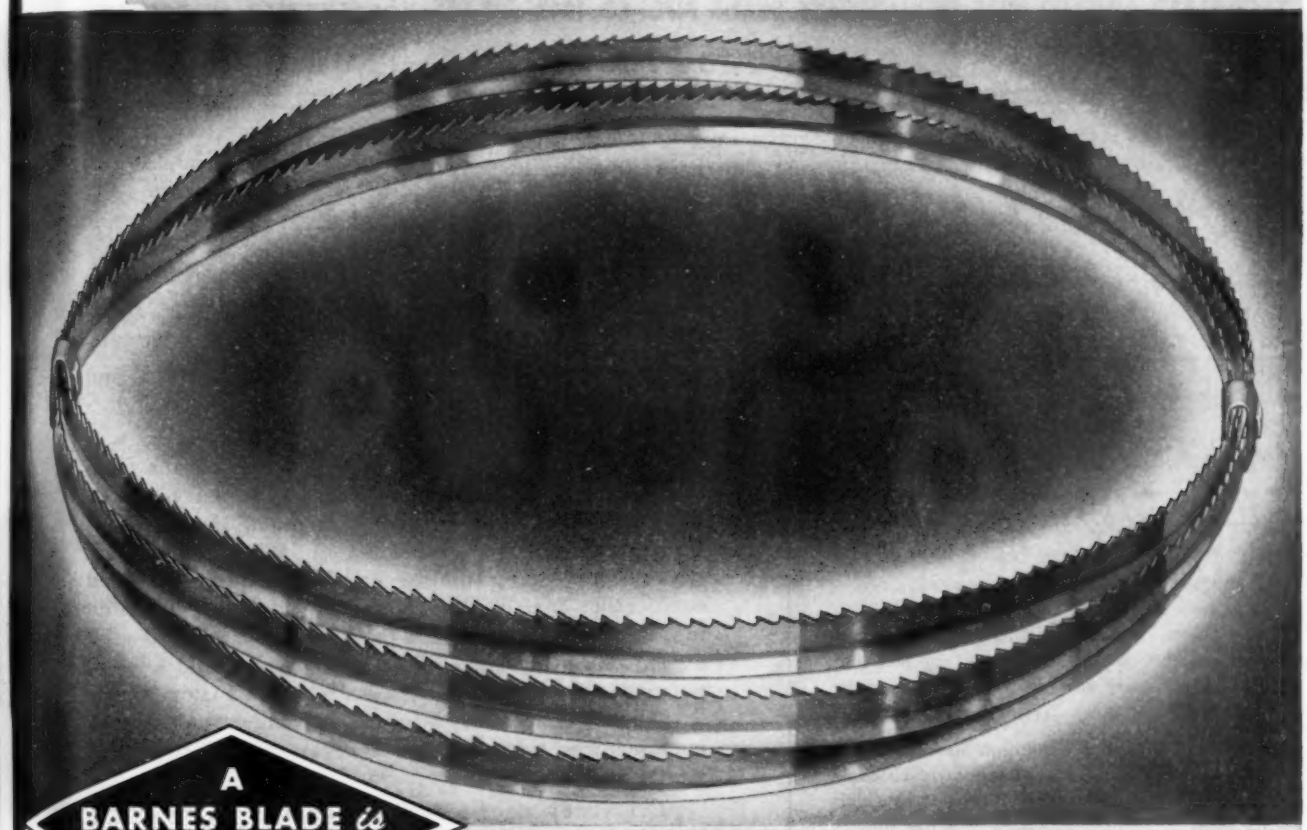
Where Quality is Never an Absentee!



A BARNES BLADE *is* BETTER

You may worry about your manpower. But you'll never worry about blade quality if the word BARNES is on the box! You get maximum productive efficiency from every Barnes hack saw blade and band saw you buy. Order from your distributor.

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DETROIT MICHIGAN

This
NEWSPAPER
advertisement was published in Washington, New York and Chicago by McGraw-Hill, to make friends for business.
BLANK MFG. CO. 1939
50 JOBS
BLANK MFG. CO. 1943
250 JOBS
BLANK MFG. CO. POST-WAR
HOW MANY JOBS?

"LITTLE BUSINESS" needs Seed Money most of all

Every Business needs Friendly Neighbors

If you want your business to operate in a favorable environment in the post-war world, you must have "friendly neighbors." That means that people must be conscious of the fact that they are directly affected by your success or failure.

The simple, direct solution to this public relations problem of industry is for each company to use the newspapers of the city in which its plant is located, to create a better understanding of the economic life of that community.

Through these Seed Money advertisements, we are explaining the advantages of the profit-motive to every American. This is being done in newspapers in Washington, New York and Chicago and in our own 22 publications.

But all of the people in every manufacturing center in the United States should be getting these or comparable messages.

We will gladly furnish you a free mat if you want to join the many companies who are doing a basic public relations job by running this Seed Money series in their local newspapers.

James H. McGraw, Jr.
President

McGraw-Hill Publishing Company, Inc.

ONE of the easiest things for you to understand, and one of the hardest things for government to understand is "Little Business."

Little Business lives right around the corner from you . . . He's the garage man who has pooled his lathe with the lathes of other garage men and opened a factory to turn out war materials . . . He's the machinist who has scraped up some second-hand equipment, hired some other machinists and turned an empty building into a source for bomb-rack parts . . . He's the boat yard owner who has parlayed a little knowledge and a lot of guts into a fleet of subchasers . . . Maybe he is one of the 21,000 sub-contractors who are helping just one large manufacturer (International Harvester Co.) fulfill his war contract.

Everybody knows Little Business because everybody meets businessmen everywhere they go.

Three cheers for Little Business, because—through courage, resourcefulness, and unlimited hours of work, businessmen are helping to win this war.

But, before you join in the cheers, take thought of what we said in the first paragraph: it is hard for *government* to understand Little Business.

You can do something more effective for Little Business than giving him the empty reward of your applause.

You can help him survive when the war is over.

And don't think it is not VITAL to you that the millions of hustling, adventurous souls who constitute the army of "Little Business" do survive.

The "take a chance" spirit of businessmen is the spark that has made America a great nation.

► Every time a businessman succeeds he makes jobs for other men and women. Every time that happens

FREE MATS: If you would like to publish this message over your own company name, or distribute it in handy booklet form, write or wire: Research Dept., McGraw-Hill Publishing Co., Inc., 330 West 42nd St., New York (18), N.Y.

"LITTLE BUSINESS" needs Seed Money most of all (cont'd)

there is more real wealth available for Americans. Multiply that by the millions of Little Businessmen and it's easy to see why it is vital that they survive.

Bear in mind that we haven't said government doesn't want Little Business to survive. Government loves Little Business. All government people get a tender light in their eyes when they speak of the Little Businessman.

But government is handicapped. It wants to help the Little Businessman, but it doesn't know how, because it does not understand the motives and rewards of business adventure.

Business is "profit-minded." That's why it is so hard for government to understand it.

Government should try to understand the profit-motive, because out of profit comes the Seed Money that creates still more jobs. Businessmen lay aside a part of their profits to be used for future development. This is called Seed Money.

Seed Money is not personal profit. It is used to develop new methods and to buy new machines that do more work in less time. These improved machines make higher wages and lower prices possible. In turn, improved machines yield still more Seed Money and the process grows in an ever widening circle. We call the result a "high standard of living."

► With this wonderful, automatic encourager of human endeavor (profit) at its command, wouldn't you think government would say "Swell, here's the device that will make jobs for everybody after the war, pay off the war debt and raise our standard of living still higher. Let's put Seed Money to work harder than ever before."

Does government say this? No, you know it doesn't. Instead, Government regards business profit merely as a source of tax money. It withers progress and improvement for all Americans by draining off the business profits that would create new jobs when the war is over.

Little Business is hit hardest of all.

Generally, a small business has no record of high profits in the years before the war. Therefore, in the eyes of government, most of the profits such a company makes is "Excess Profit" and is taken away in taxes.

What will Little Business do when the war is over? Will he hire his share of returning soldiers, and out-of-work government people, as well as keep the people who are working for him now?

To do that, he will need the best machinery; he must pay for improvement of his products, and finance the distribution and sale of those products.

He'll have the brains and courage for all that, but he won't have the money.

But there are millions of Little Businessmen. They will get together. They and their friends will bombard Congress. Another government bureau will be set up.

► Government money will be loaned. But a funny thing will happen. Little Business will not be free to "take a chance" with this money, because it belongs to the government. But "taking a chance" is the life breath of all business, especially Little Business. There will be a penalty on courage.

You, dear reader, whether you are a bureaucrat, business or professional man, farmer or laborer, can't afford to let that happen to the venturesome business spirit that sustains our national life.

You can do something about it, too. You can help spread the knowledge everywhere that production in war and good living in peace depend upon healthy, constantly improving business and industry. You can be against monopoly and still know that Big Business really exists to serve the millions of men who are Little Business, and depends upon them for its own existence.

You can believe in social reform, and still see that it's one thing to kill the weeds in our Industrial Victory Garden and another to attack the crop.

You can tell your Congressman that the most practical post-war planning he can do is to help in framing laws that will create a favorable environment for business in the post-war world.

"Industrial Progress
is the Source of all Good Living."

THE McGRAW-HILL NETWORK
OF INDUSTRIAL COMMUNICATION

22 publications, which gather "war-news" from the "war-production-front" through a staff of 153 editors and 725 engineer-correspondents . . . More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

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Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

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The BURA-WAY Makes Possible . . .

- Generation of relief angles with uniform support to the cutting edge, as measured in the direction of tool feed
- Every cutting tool a precision instrument
- Precise duplication of a cutting tool in any number
- Cam-controlled maintenance of cutting tools to precision standards
- The finest finish ever produced on a cutting edge
- Perfect grinding control of any radius or curvature involving any number of radii

What This Adds Up To . . .

- Materially increased tool life
- Greater output of work pieces
- Practical salvaging of form tools
- Reduction of work-piece spoilage
- Savings in material and man hours
- The opportunity, for the first time, to change tools at predetermined intervals
- Tremendous savings both now and later when we return to peace-time production

Write on company letterhead for informative literature on the Bura-way.

JAMES DONALDSON COMPANY, INC.
230 PARK AVENUE NEW YORK, N. Y.

FAVORITE *Reversible* RATCHET WRENCH

THE ONLY WRENCH WITH ALL THESE FEATURES . . .

- Each head fits two different sizes of nuts
- Positive, instantly reversible ratchet action
- Can be used over long studs
- Does not chew nuts
- Operates in narrow spaces
- Tightens nuts quicker
- Cannot slip off nuts

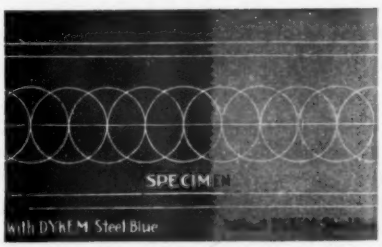
Three sizes of handles . . . each handle takes five different heads . . . each head fits two different size nuts. Write for circular and prices. Carried by leading mill supply houses.

PROMPT SHIPMENT
Assured by large manufacturing facilities. Made by makers of PALMETTO and other self-lubricating packings.

GREENE, TWEED & CO.
Bronx Blvd. at 238 St., New York 66, N. Y.

DYKEM STEEL BLUE

STOPS LOSSES **making dies & templates**



simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301 B N 11th St., St. Louis, Mo.
In Canada: 444 Pacific Ave., Toronto, Ont.

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HAND CUT • MILLED CUT
GROUND FROM THE SOLID

There is a Grobet Rotary File, Cutter, Diesinkers Bur in shape, size, and coarseness of cut for every type of hard or soft metal, plastic, wood, etc. Send for Catalog DR. illustrating the complete line in full size, speed charts, etc.

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MACHINES AND PARTS,
SPECIAL TOOLS, ETC.
to your specifications

SPECIAL ENGINEERING WORK
. . . on Contract

It will pay you to investigate our facilities. As designers and builders of wire and ribbon stock forming machines we can offer you skilled and experienced assistance. Send us your blueprints or samples for prompt quotations.

We also solicit your bids for cam milling

THE A. H. NILSON MACHINE CO. *Bridgeport, Conn.*

ADDITIONAL FACILITIES FOR CONTRACT MANUFACTURING

Hand screw machines up to 1½ dia.
Turret lathes up to 15" dia.
Milling machines
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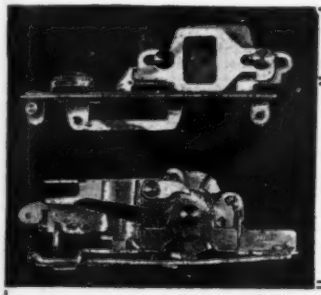
established 1922



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We can make long or short runs in any metal. Our modern equipment and methods, backed by 50 years of experience, are your guarantee of satisfaction. Our manufacturing facilities also include screw machine products, tools, dies, jigs and fixtures.

Your order is assured of quality workmanship by skilled mechanics. We will furnish prompt quotations on your blueprints or samples. Write us today!

"Greater Savings with Greist"

THE GREIST MFG. CO. 546 Blake Street New Haven, Conn.

METAL STAMPINGS
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Lathes, Milling Machines, Drill Presses, Riveting, Hot Dip Tinning, Jigs and Fixtures. Investigate TODAY.

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DESIGN & BUILD
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QUALITY
SCREW MACHINE PRODUCTS
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WALTHAM
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PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

Gray Iron and Semi Steel Castings, also alloyed with nickel, chrome, and molybdenum. Wood, Iron, Brass and Aluminum pattern work.
KING FOUNDRIES, INC.
Phone 823 North Wales, Montg. Co., Pa.
22 Miles from Philadelphia, Pennsylvania

DOES IT WORK?

Is advertising in the Contract Work Section helping *American Machinist's* subscribers and readers find outside help when they need it? Does advertising in this section really do its job?

If you have idle equipment to put to work, you will want the answers to these questions. You can get them quickly by addressing CONTRACT WORK DEPARTMENT, *American Machinist*, 330 West 42d St., New York, N. Y.

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In round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
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CONTRACT MANUFACTURING
ACCURATE SHEET STEEL
STAINLESS STEEL, MONEL OR
OTHER ALLOY FABRICATION
OUR SPECIALTY
CAPACITY ⅛" AND LIGHTER
THE KIRK & BLUM MFG. CO.
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AUTOMATIC SCREW MACHINES
Large production capacity on several
Gridley, Four Spindle, up to 1¾" Diameter
New Britain, Six Spindle, up to 1⅝" Diameter
Our skilled mechanics are a guarantee of your satisfaction. Send prints or samples for quotations on large quantities.
VETOOL MFG. CO. INC.
401 Broadway New York, N. Y.

We have facilities available for additional work. Just now we are building precision instruments to blueprint and have lately completed a production job. Our machine shop is small, modern, and efficiently manned; it enjoys an excellent reputation.
KERN COMPANY, 2 John St., New York (7)

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Facilities include 9" South Bend Bench Lathe, #2 Brown & Sharpe Milling Machine, Drill Press and 8"x8" Shaper. The usual line of hand tools and equipment plus experienced workmanship assure your satisfaction. Your inquiries invited.
C. VANDEGRIFT CO HOCKESSIN, DELA.

MACHINE DESIGNER WANTED

We have an opening for a man with wide experience in the designing of automatic and semi-automatic machine tools and hydraulic control application to machine tools. Excellent advancement, opportunity for right man. Old established St. Louis concern.

P-619, American Machinist
520 No. Michigan Ave., Chicago, Ill.

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

MECHANICAL DRAFTSMAN with practical mechanical experience in blanking, drawing and forming dies for sheet aluminum products in defense plant in Midwest: give experience and full particulars. P-593, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

TOOL MAKERS for defense plant in Midwest; give experience and full particulars. P-594, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

GRINDING WHEEL SALES ENGINEER. Expanding, well-known New England grinding wheel manufacturer has opening for draft-exempt man with mechanical background. Salary $300.00 a month plus expenses and bonus. All replies will be considered confidential. P-597 American Machinist, 330 W. 42nd St., New York, N. Y.

ENGINEER—Research and Development by pump manufacturer, near New York. Diversified experience in high pressure hydraulic and low pressure rotary pumps. This job is long range research and development for both war and post war. Give full particulars in first reply, confidential, permanent. Write P-606, American Machinist, 330 W. 42nd St., New York, N. Y.

ENGINEER, to carry-on, direct and expedite the development of new Mechanical Processes, Tooling and Electric Powered Machines and equipment. P-607, American Machinist, 330 W. 42nd St., New York, N. Y.

PLANT EXECUTIVE—Wanted by old established builder of high grade machinery. Plant employs 1,000 have highest rating now operating on 100% war work and with complete line of products for post war demand. The plant is modern, well located in New York State, working conditions are congenial and the facilities and equipment are up to date. We are looking for a high grade man having engineering training and practical machine shop experience. He should be capable of earning between $7500.00 to $10,000.00 to start with, plenty of opportunity for advancement based on ability and results. Application will be considered in confidence. Give in first letter full information as to experience with whom, for how long, what responsibilities and compensation earned, also age and references. P-620, American Machinist, 330 W. 42nd St., New York, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS — This advertising service of 33 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y.

POSITIONS WANTED

AUTOMATIC-SCREW MACHINE EXPERT. Experienced on Swiss Automatics, Brown and Sharpe, Cleveland and Multiple Spindle Automatics. Able to lay out cams for Swiss and Brown and Sharpe Automatics. 22 years experience. Age 40. Married, 2 children, citizen. Likes to locate in Connecticut. PW-610, American Machinist, 330 W. 42nd St., New York, N. Y.

WORKS MANAGER, General Manager experienced in directing engineering, production, planning, tooling, and all phases of machine shop and assembly operations. Must have post war program. PW-621, American Machinist, 330 W. 42nd St., New York, N. Y.

Wanted Machine Capacity For Sub-Contract Work

Responsible Advertiser contacting leading Detroit Sub-Contractors has Sub-Contract work for well-equipped Precision Machine Shop. Only exclusive representation considered. Write

CW-617, American Machinist
520 N. Michigan Ave., Chicago, Ill.

Wanted-NEW INVENTIONS and IMPROVEMENTS

A well established and favorably known plant with long experience in, and extensive special equipment for, the precision manufacture of high-speed rotating machinery seeks new inventions and improvements for production after the war. If a patent or published description of your device is available, send a copy; but if not, indicate only its purpose or field and advantages. If the idea seems to have possibilities, further arrangements can then be made. Address

BO-616, American Machinist, 330 West 42 St., New York, N. Y.

SELLING OPPORTUNITIES

OFFERED—WANTED

Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITY WANTED

SALES REPRESENTATIVE for state of NEW JERSEY. One or two non-competitive accounts wanted in metal-working machinery or accessories. Established office and contacts. Graduate engineer competent and experienced in technical service-sales. SA-611, American Machinist, 330 W. 42nd St., New York, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS. Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington, D. C.

CONTRACT WORK

WORK WANTED — For advertisements of work wanted see page 329.

THE NICHOLS TABLE OF SCREW THREADS AND TAP DRILLS

$1.75

Now is the time to order your copy. One table, 60 PAGES long, listing all standard screw threads with essential thread data.

THE NICHOLS CO. 1213-K St., S-W., Cedar Rapids, Ia.

NEW INVENTIONS WANTED

Mechanical and electrical devices which can be used to promote our war production program. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

WANTED AT ONCE

Two-spindle Profiler

with rotary table

The Bagley and Sewall Company
Watertown, N. Y.

PROFESSIONAL SERVICES

Engineering and Research Co.

MACHINE DESIGNERS
MECHANICAL ENGINEERS

High Production Dies, Tools, Jigs and Fixtures, Methods, Job Analysis, Consultants and Supervisors, Industrial Engineering and Research

Chatham Phenix Building, 29-28 41st Ave.
Long Island City, New York

FOR SALE

(Additional For Sale Advertising on pages 331-338

AUTOMATICS

2¼" Gridley Auto. Screw Mach., 4-spdl. MD. (2)
1½" Cone Auto. Screw Mach., 4-spdl. MD.

BORING MILL

No. 3A. Universal Horiz. Boring, Drilling & Milling Mach., 3" spindle, table 24x48", arr. for silent MD. with 3/60/220-440 V. Motor, including 1 boring bar & 1 cutter.

DRILL—Radial

5' Dreses Plain, gear box, arranged for motor drive including 3/60/220 V. motor.
Delivery August.

GEAR HOBBER

No. 3 Adams "Farwell," cap. 24/36", with change gears, 5 hobbs. Wt. 4000 lbs. Excellent.

LATHE

24"-48"x14' McCabe 2-spindle, 45" face plate, chuck jaws, 3-step cone and countershaft.

Galbreath Machinery Co.
Empire Building Pittsburgh, Pa.

Quick Delivery—Used Equipment

MILLER, 5-B Becker Vertical, M.D.
RADIAL, 2½' Mueller, M.D.
PLANER, 24"x24"x6' Cincinnati, M.D.
DUPLICATOR, Detroit Universal, M.D.
SWAGER, #6 Torrington, M.D., like new.
BUFFERS, 1—3 HP U.S. 900 RPM.
2—5 HP U.S. 870 RPM.

Especially for Plexiglas.

LATHES, 1—14"x6' Flather, L.C.G.
1—18"x14' Bradford, L.C.G.
1—24"x18' Bement, L.C.G.
1—32"x16' Crane, L.C.G.
TURRET LATHES, 2—#3 Foster.

J. LEE HACKETT COMPANY
1961 E. Milwaukee Ave. Detroit, Mich.

FOR SALE

14—20 and 85—23 Gardner Grinders, double opposed discs—including fixtures. Guaranteed like new.

AUSTIN P. CULLON
Tool and Engineering
2926 Biddle Ave. Wyandotte, Mich.

SEARCHLIGHT SECTION
AMERICAN MACHINIST

UNDISPLAYED RATES

Positions Vacant and other classifications—10 cents a word, minimum charge $2.00 an insertion. Allow 10 words for box number address. No additional charge for forwarding replies.

Positions Wanted—½ of the above rates.

Discount of 10% for full payment in advance for 4 consecutive insertions of undisplayed advertisements.

Proposals—50 cents a line.

DISPLAYED RATES

Space is sold by the advertising inch (measuring approximately ¼ inch deep by 2¼" wide). 3 columns—30 inches—to a page. Rates start at $6.50 per advertising inch.

HILL-CLARKE

Modernized

CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH

SIZES AVAILABLE

10x36	10x72	14x72	16x72
10x50	14x50	14x96	18x96

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke Patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

Send for a copy of our catalog "Super Grinding."

HILL-CLARKE MACHINERY CO. CHICAGO U.S.A.

Have you any NORTON grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO.

649 WASHINGTON BOULEVARD **CHICAGO, ILL.**

MANY TOOLS READY FOR IMMEDIATE DELIVERY

Automatic, 1⅝" No. 55 National Acme
Automatic, No. 6A Potter & Johnston.
Chuckers, 4½" Gridley "H" 4 spindle.
Chuckers, 7" Baird 6 spindle.
Borer, 3⅜" bar Beaman & Smith horizontal.
Brake, 10' Ohl 255 ton capacity press brake.
Broaches, No. 3 J. N. LaPointe double.
Broach, No. 4 J. N. LaPointe single.
Coiler, ⅝" No. 5 Sleeper & Hartley spring coiler Series 326.
Compressor, 550' National 3 cyl. vertical.
Compressor, 1400' Sullivan WN3.
Drill, 20" No. 201 Barnes heavy duty.
Drill, 30" Rich tool Co., heavy duty.
Drill, No. 430 Barnes 2 way horizontal.
Drill, No. 1 Baush 16-8 spindle multiple.
Drills, Nos. 12 & 12C Natco 12 spindle multiple.
Drill, No. 13 Natco 18-12 spindle multiple.
Drill, 21" Weigel sliding head T.A., M.D.
Drill, W. F. & J. Barnes hydraulic vertical for boring & reaming, 12 spindle.
Drills, Nos. 15½, 15½D and 15½F Foote Burt.
Gear hobbers, No. 12 Barker Colman.
Gear hobbers, No. 16 HS Gould & Eberhardt type B
Gear cutters, Nos., 3 & 4 Brown & Sharpe.
Gear hobber, No. 1, 8"-10" Lees Bradner.
Gear chamferer, Lipe double spindle.
Gear checker, National Cleveland Model B.
Gear shapers, Z1 (61) & Z2 (624) Fellows.
Grinders, 10"x48" to 16"x36" Landis cylindrical.
Grinder, 10"x50" Norton cylindrical.
Grinders, Nos. 3 & 13 Brown & Sharpe universal.
Grinder, No. 3 Cincinnati universal.
Grinder, No. 120A Gardner 20" opposed double disc.
Grinder, No. 84 Gardner 24" opposed double disc.
Grinder, No. 15A Bryant internal.
Grinder, 20"x12"x50" Safety Emery Wheel Surface.
Grinder, Cincinnati face milling cutter.
Grinders, Nos. 50 and 60 Heald cylinder.
Hone, No. 211 Barnes vertical.
Keyseater, No. 4 Mitts & Merrill, 2½"x18".
Lathe, 14"x19" Fay automatic.
Lathe, 22"x10' American engine-turret.
Lathe, 36"x16' Putnam heavy geared head.
Lathe, 22" Libby turret 4¼" spindle hole.
Lathe, 24" Gisholt turret 6¼" spindle hole.
Lathe, 26" Libby turret 4½" spindle hole.
Lathe, 28" Steinle turret 8" spindle hole.
Lathe, Melling 6 cylinder crankshaft.
Lathe, 1"x18" Pratt & Whitney full automatic.
Lathes, 3¼" & 4"x36" Lo Swing.
Miller, No. 4 Cincinnati plain.
Miller, No. 1 Davis & Thompson double end.
Miller, No. 3 Turn millers.
Miller, 48" Oesterlein tilted offset.
Miller, Taft Peirce thread.
Miller, Hall Planetary thread.
Miller, 28" Cincinnati semi-auto duplex.
Miller, 36" Garvin cam or form.
Millers, Type 10 & 45 Producto-Matics.
Polisher, Divine Model RM-X8S rotary.
Planer, 54"x54"x28' Hamilton 3 head.
Punch, No. 1½ Lang & Allstatter.
Punch, Rock River 26" throat.
Rolls, No. 2A Ajax taper forging.
Roll, Waterbury Farrel thread roller.
Roll, No. R-60 Yoder crown fender.
Riveters, Nos. 2A, 5½B & 7B High Speed.
Sand Mixer, Baker Perkins.
Screw driver, No. 61AA Bodine.
Swager, No. 6HS Longelier.
Saws, Nos. 12, 12B, 14 & 17 Higley cold, 4" to 8" capacity.
Saw, No. 15 Lea Simplex cold, 5½" capacity.
Saw, 6" Nutter & Barnes cold, 6" capacity.
Saw, 36" Newton cold.
Shaper, 24" Gould & Eberhardt.
Shaper, 36" Morton draw cut.
Shear, 8"x8"x1" Lang & Allstatter angle iron.
Threader, ¾" Landis.
Threader, 2" Landis, double head, bolt, pipe & nipple.
Upsetter, 2" National.
Upsetters, 4" Ajax.
Washer, Blakeslee metal.
Wire Machine, ⅜'x3' Shuster.

Ask for Your Copy of Stock List No. 175

MILES MACHINERY CO., SAGINAW, MICH.

LATHES

16" x 6' Lodge & Shipley Pat. Hd.
16" x 6' Lodge & Shipley Cone, Q.C.
21" x 10' LeBlond Heavy Duty 3 S.C.D. D.B.G.
26" x 10' Niles, Cone, Q.C.

GRINDERS

Fitchburg Spline Shaft Grinder.
#55 Heald Cylinder.
Lees Bradner Gear Grinder.

GEAR MACHINERY

18" Gleason Gevel Gear Generators.
6" Bilgram Bevel Gear Generator.
18H Gould & Eberhardt Gear Hobber.
#1 Adams Gear Hobber.
#4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.
#3—26" B & S Gear Cutter.

PLANERS

24" x 24" x 6' Cincinnati Planer.
24" x 24" x 6' Cincinnati Planer, Box Bed M.D.
72" x 60" x 28' Pond 2 heads, belt drive.

MISCELLANEOUS

18" Niles Bement Pond Slotter. Motor driven thru gear box.
12 Ga. 30" Throat Quickwork Shear, M.D.
14" Niles Slotter.
1500# Bell Steam Hammer.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second Street Cincinnati, Ohio

5' Radial Drill, Bickford, M.D.
20" x 14' Bridgeford Geared Head Lath.
#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
50" G & E Gear Cutter.
24"Gisholt Turret Lathe, 6¼".
10' Bridgeport Knife Grinder.
20"-21"-32" Shapers.
36" Morton Draw Cut Shaper.
No. 2 Baker Keyseater 2" x 20".

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

POWER PRESSES
BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED
JOSEPH **HYMAN** & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

2—Gridley 4-spindle Model H Chucking Machines, 4" capacity, with A. C. motors and 3-jaw air operated chucks. Excellent condition. Immediate delivery.

D. E. DONY MACHINERY CO.
47 Laureiton Road, Rochester, N. Y.

IN STOCK!!!

"FALK" for DEPENDABILITY in Rebuilt Machinery

LANDIS GRINDER

10x36 Landis Plain Grinder Self contained. Complete with Chuck. Back Rests and Centers.

MILLING MACHINES

No. 4 LeBlond Heavy Duty Plain Miller with power rapid traverse, and vertical milling attachment, belt drive, double back geared, table working surface 16x62, Serial No. 1269.

P & W Duplex Miller No. 2.
Sanford No. 1½ Production Miller, Rotary Table.
Cleveland Vertical Miller No. 1 (New).

GEAR CUTTERS

No. 1 Adams Farwell Gear Hobber, complete.
No. 2 Whiton Spur Gear Cutter, Auto.
1—No. 3 Barber Colman Gear Hobber.
Van Norman No. 1 Pinion Cutter.
No. 12 Barber-Colman Gear Hobber.

SHAPERS AND SLOTTERS

26" Cincinnati Triple Geared Shaper, Friction Drive.
20" x 20" x 36" N-B-P Shaper-Planer, Arranged Motor Drive.
12" New Haven Slotter.
16" Kelly Back Geared Crank Shaper, cone drive.

PRESSES, BRAKES & SHEARS

MARIETTA Power Press Brake 104" between uprights. Dual rams to permit operations on separate dies from both sides of press. Bed area 20" x 104", each ram 6¼" x 98", 4" crank shaft, 3" stroke. Excellent condition.
Ohl power press brake 8' x 3/16 cap.
Ohl power square Shear 8' x 3/16 cap.
Niagara No. 135 Deep Throat Punch Shear, Hydraulic Wheel Press 200 tons, 42" between strain bars, self-contained, belt drive.
Niagara 36" foot Shear, 16 ga.
Kutscheid all steel 36" x 16 ga. Foot Shear.
Pittsburgh 36" x 3/16" Plate Shear, no hold-down.
No. 132 Bliss 14 ga. 12" throat Slitter.
No. 232 Bliss 12 ga. 18" throat Slitter.

RADIAL DRILLS

2—Niles-Bement-Pond, box column 5' arm.
1—Niles-Bement-Pond, box column 6' arm.

TURRET LATHES

21" Gisholt Universal Turret Lathe with 3⅜" hole in spindle, 2-step cone for 5" belt.
Jones & Lamson 3x36 Double Spindle, air chuck equipment.
Jones & Lamson 3 x 36 Single Spindle, Geared Head, Single Pulley Drive.

COILING MACHINES

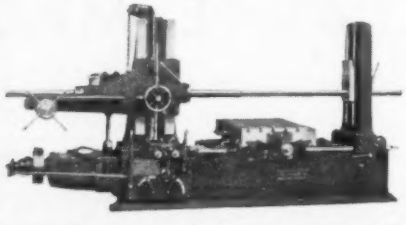
No. 1 and No. 2 Sleeper & Hartley BX cable coiling machine, ⅜ and ½ in. capacity. Last used for speedometer cable. Complete.

GRINDERS

No. 6 Besley Double Opposed Disc Grinder.
No. 2 and No. 3 Brown & Sharpe Cutter Grinder.
Taft-Peirce Automatic Pin Grinder.
Badger No. 2 Double End Disc Grinder 16" disc, ball bearing, spindle, Universal table.
Gardner No. 1 double end Disc, 12" Ball Bearing belt drive.
Gorton, double end Disc Grinder, 18" discs.
Seller Tool Grinder.
Greenfield No. 2 Universal Tool & Cutter Grinder, complete equipment.

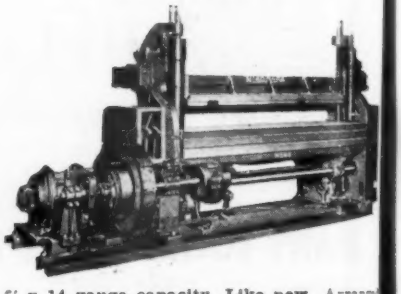
#32 LUCAS "PRECISION"

Boring—Drilling and Milling



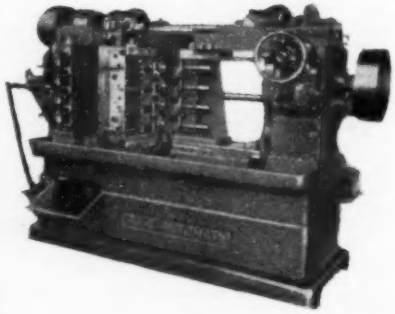
Lucas #32 precision horizontal boring, drilling, and milling machine. 3¾" Bar. Extra length bed and table. Silent chain motor drive. 7½ H.P. G.E. 3 ph., 60 cy., 440 v. Push button control. Fully Guaranteed.

#98 NIAGARA



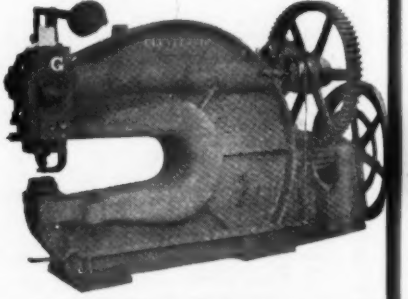
6' x 14 gauge capacity. Like new. Arranged for motor drive.
Working length 72", cap. 14 gauge; min. width of fold at cap. 1" gaging range (narrow folds) ⅜" to 1⅛", max. gaging range 72" left of chamfering bar 3". Shipping wt. 12,690 lbs.

1¼" CONE AUTOMATIC



This machine is primarily for cutting off bar stock, or tubing. Can be arranged for light forming, chamfering and drilling operations.
Size 1¼" round; 1 5/64 hex; ⅞ sq. max. feed 12" wt. 10,000 lb. with 15 H.P. motor.

MODEL G CLEVELAND



Vertical Cleveland, model G, open Gap Punch 52" throat, arch Jaw, 2" hole thru 1" plate cap. arranged for Gear motor drive. 10 H.P. 3 ph., 60 cy., 220 v.

Every Item Guaranteed

FALK MACHINE CO COMPANY

18 WARE

ORDER NOW!!!

"FALK" for DEPENDABILITY in Rebuilt Machinery

LATHES

Putnam 30" x 12' Heavy Duty Screw Cutting Engine Lathe, Quick Change Gear.
Putnam 26" x 12' Heavy Duty Screw Cutting Engine Lathe, Quick Change Gear.
20" x 18' Prentice Plain Change Lathe, with raising blocks to swing 42", belt drive.
20" x 16' Reed Light Type Plain Change Screw Cutting Engine Lathe.

24" Bullard Vertical Turret Lathe Rapid Production, motor drive.
30" Colburn Vertical Turret Mill, M.D.
3½" Rochester Floor Type Horiz. Boring Mill, M.D.

18" x 12' Hamilton Plain Change Lathe.
19" x 8' LeBlond Heavy Duty Production Turning Lathe.
18 x 6 South Bend Plain Change Lathe.
16 x 8 American Quick Change Gear Lathe.
16 x 6 South Bend Plain Change Lathe.
14 x 6 Reed Lathe, Plain Change, motor drive.
16 x 8 American Quick Change Gear.
16 x 8 Hendey Tool Room, with Taper att.
18 x 8 Superior Heavy Duty.
18 x 12 Champion Tool Wks. with Taper and Collets.

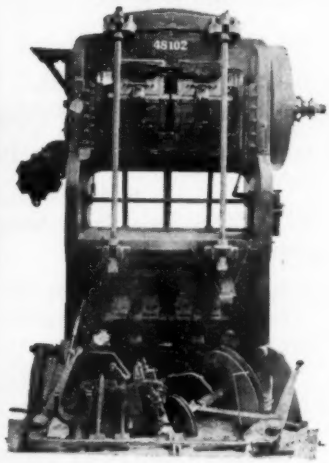
INTERNAL GRINDER

Greenfield No. 12, Hydraulic Feed, motor drive; cap. swings 15", Grinds automatically ¾" to 5" dia., 4" deep, New in 1928.

CONCO ELECT. HOIST

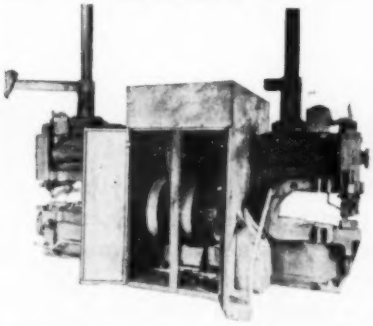
Conco 250 lbs. Elect. Hoist $139.50
Conco 500 lbs. Elec. Hoist $149.50 ea.
Conco 1000 lbs. Elec. Hoist $159.50
New Hoists for Defense Plants

310S BLISS



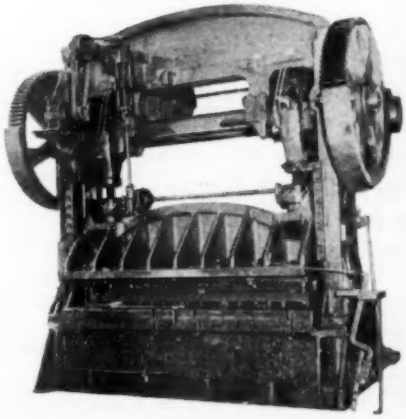
Bliss 310S Automatic Gang press. For rapid accurate production from ribbon stock, small sheet steel or sheet brass articles. 180 Finished Blanks per min. Does eight operations at once. Dies operate an independent sub-press. Tie rod frame.

1¼" WICKES PUNCH



Wickes Double End Punch and Shear 1¼" hole thru 1¼" plate cap.; Punching end 48" throat, Shearing end 36" throat, continuous 6" x 1" plate.

TOLEDO 94½-J



TOLEDO 94½-J 200 ton press. Straight side, tie rod, double twin, direct geared M.D. with 30 H.P. 3 ph. 60 cy. 440 V. motor & con. Forced feed lub., pneumatic controlled friction clutch & brakes. Bed area—120" right to left x 50" front to back. 12" stroke, 18" sheet height. Bed equipped with spring cushions. Weight approx. 80,000 lbs.

DRILLING MACHINES

Fox #15H multiple spindle drilling machine. Hydraulic feed, with 35 #1 Morse taper Spindles, 17" x 34" head, serial No. 1065. Motor drive 10 H.P., 3 ph., 60 cy., 220 v.

Fox #D31 multiple spindle drilling machine. Drilled for 32 spindles and equipped with 16 #2 Morse taper. Power feed, 17" x 34" head, Serial No. 626, motor drive 10 H.P., 3 ph., 60 cy., 220 v.

Natco #12 multiple spindle drilling machine. Single pulley, Belt drive, Drilled for 16 Spindles and equipped with 6 #2 Morse taper. Power feed.

PROFILERS

Pratt & Whitney No. 12 two-spindle motorized Profiler. Table 12" x 15" equipped with 6" raising blocks, and 5 H.P., 3 phase, 60 cycle, 220 V motor —Turner drive mounted and wired to push button control—rebuilt and guaranteed.

200 TON NIAGARA

1—Niagara #612 D press. Straight side, double crank, back geared, 200 ton cap., 3" stroke, bed 60 x 38

COMPANY
ANY MERCHANTS
8 WAR OCHESTER, N. Y.

FALK

Telephone MAIN 6347-8

SICK WARD

THAT'S JUST WHAT YOU SEE . . . a sick ward in a *machine tool hospital.* It may be different from anything you know of a hospital, but it's pretty important nonetheless, for here is where ailing machine tools go for diagnosis, reconditioning and rehabilitation by top technicians, the Simmons engineers. But here the comparison with medical hospitals ends, for from the Simmons plant no machine tool leaves without a complete overhauling whether it is just plain rundown and in need of overall repair, or obsolete and seeks modernization, or requires conversion to regain its usefulness.

All are dismantled and rebuilt from the ground up. Motor drives replace cone drives in some cases; power rapid traverse is applied in others. Beds or tables are lengthened, housings widened, rails and heads raised. All machines are re-assembled in the same manner followed by the original manufacturer and tested under power, and all work is guaranteed. A certified test report and guarantee accompanies each rebuilt machine.

If any of your metal-working equipment can benefit from this method, ask for further details. Simmons-Rebuilt machine tools are performing important jobs today.

Awarded to the employees of the Simmons Machine Tool Corp., Aug. 20, 1942. Service star awarded Feb. 13, 1943.

IN STOCK

Every machine listed in this column is in our warehouse at press time.

- No. 3 WARNER & SWASEY Universal Hollow Hex. Turret Lathe, 3⅛" capacity, Belt or Motor Drive.
- 42" PUTNAM Double End Car Wheel Lathe, M.D.
- 6" x 6" x ⅝" Double Angle Shear.
- Beam Shear 20", 60# and smaller.
- 60" Throat 8" x 1 1/16 Shear.
- 54" Throat 1¾" x 1⅛" Punch.
- 3¼" x 12" TRIPLEX Pumps, 1500 to 2000# pressure, 60 to 70 GPM.
- 15" GLEASON Bevel Gear Generator.
- No. 9 N.B.P. Vertical Miller 32" rotary table, 4" dia. spindle, Motor Drive.
- 30" x 30" x 10' NEWTON Slab Miller horizontal arbor, M.D.
- 48" x 48" x 24' NBP Heavy Planer, Two Rail, One Side Head, Motor Drive.
- 48" x 48" x 20' PATCH Planer, 4 heads, 230 Volt D.C. Rev. Motor Drive.
- 52" N.B.P. Rotary Planer, M.D.
- 60" NEWTON Portable Slotter, 230 Volt D.C. Rev. Motor Drive.
- 24" NEWTON Cold Saw, 7½" capacity, M.D.

Write TODAY for the "Simmons Way of Engineered Rebuilding."

SIMMONS ENGINEERED *Machine Tool* REBUILDING

SIMMONS MACHINE TOOL CORPORATION

Main Office and Plant: **1759 N. BROADWAY, ALBANY 1, N. Y.**

New York Office: **149 BROADWAY**

GEAR MACHINES

36" G. & E. Cutter
B. & S. No. 3-26" Cutter
Gleason 11" Bevel
Fellows No. 6, 61 Sharper

BORING MILL

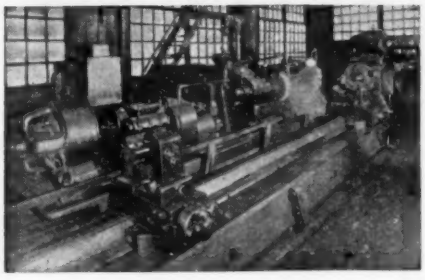
2½" G. & Lewis, M. D.
2½" Binsee
10' Niles Vert. 2 heads
3½" Rochester, M. D.
4", 4½" Gisholt and Niles
54", 60" Colburn, M. D., 2 heads
36" Bausch, Niles 2 heads
42" Bullard, 2 heads
36" Bullard Vtl Turret

LATHES

48" x 26' Niles
48" x 14' B. & Emmes Q.C.
26" x 14' Rahn-Larmon, rais. blks to 34", Q.C.
36" x 21' Wickes 3 step, Q.C.
30" x 20' LeBlond Std. chg.
24" x 12' LeBlond, M. D.
26" x 24' Putnam, S.Q.C.

AUTOMATICS

3—Potter & Johnston No. 6A Turret Lathes, M. D.
10—Gridley ¾"—4¼" sgl and multiple spindles



50" x 28'

NORTON

ROLL GRINDER, M. D.

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Cincinnati No. 5 Plain, M. D.
B. & S. No. 33, M. D.
Milwaukee No. 3 Vert., S.P.D
Cleveland No. 2 Univ, S.P.D.

GRINDERS

P. & W. 14", M. D., B. B.
Norton 12 x 18", M. D.
Landis 14 x 52", S.P.D.
Modern 12 x 28" M. D.
B. & S. No. 10, 11, 14
Blanchard 26" Surface S.P.D.
Diamond 12 x 36", M. D.

TURRET LATHES

Gisholt 24", 6¼" hole
Gisholt 28", 3¼" hole
Gisholt 21", 3½" hole
Libby 18", S.P.D.
King 34" VTL. Turret
W. & S. No. 3A, S.P.D.
Foster No. 1B, S.P.D.

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1—W-F High-Low Pump, 60 GPM at 300#, WP., 3 GPM at 6500 High WP
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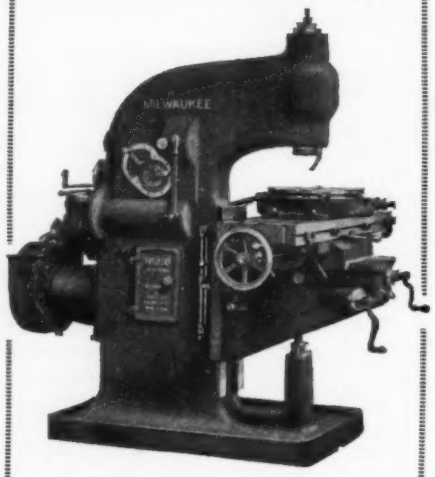

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30x30"x8' Gray, 1 head
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Grinder 60" plate
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Grinder, Sellers Tool
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(2) David Brown (England) Worm Gear Grinders
15" Gleason Spiral Gear Generator
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Good condition—"priced very low"

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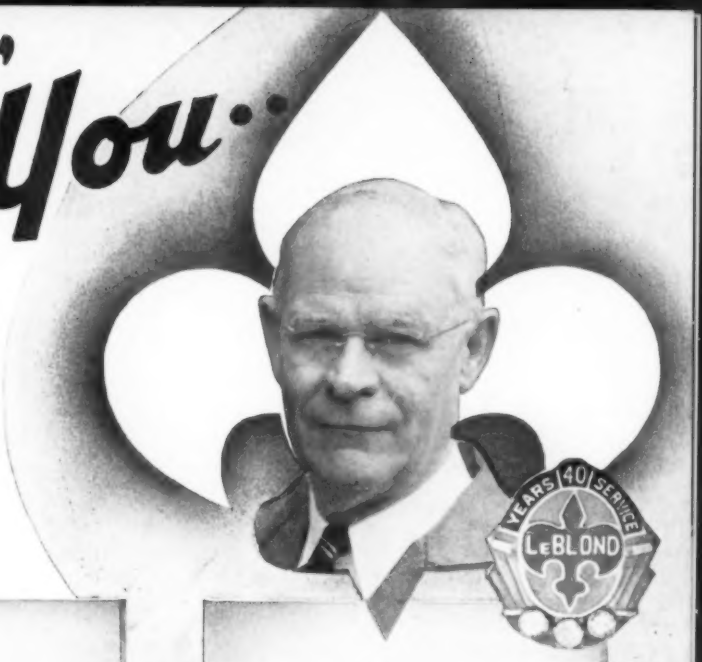
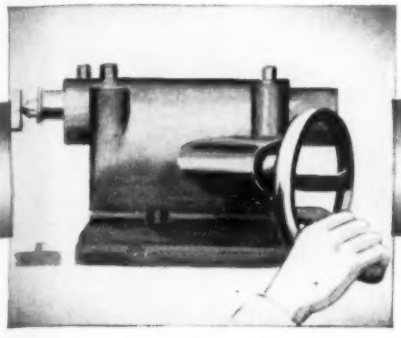
I'm Tellin' You . . .

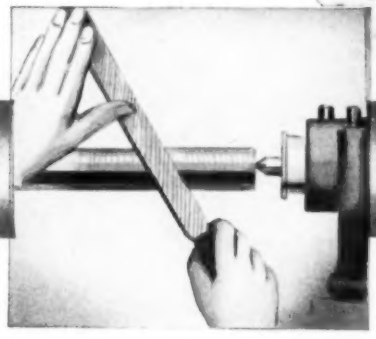
No. 12 in a series on "Keeping 'em Turning" by Charles Carr, 37 years at LeBlond.

"We old-timers have been passing along the tips on 'Keeping 'em Turning' and we've given you about every important point in the book. But no matter how good a job of turning you've done, it's pretty tough to get a finish smooth enough to be used directly in service. You won't always have a grinding machine available and that's where filing and polishing come in. This is the way an old-timer does it . . . "



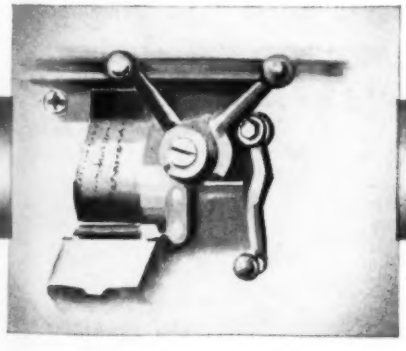


With work set up on headstock center, run tail center up tight, then slack off slightly and start lathe to run at twice finish turning speed, adjusting center to allow dog to click in face plate but not to allow rattle or end shake.

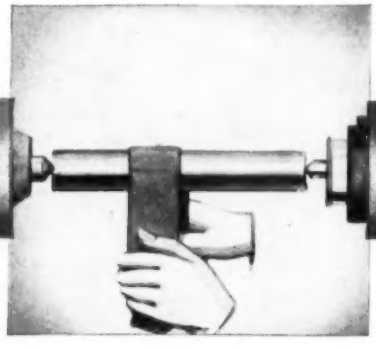


Use a 12-inch mill file with slow, even strokes, lapping from side to side. Use a long, slow forward stroke and press firmly and evenly on the revolving piece being filed. Relieve pressure on return stroke.

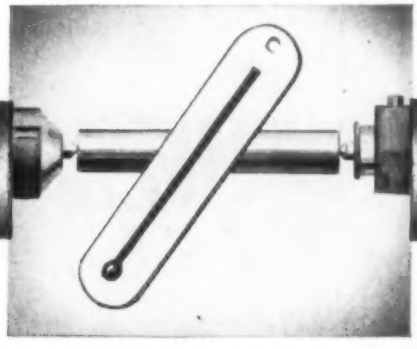
Stop lathe and try diameter with micrometer frequently until whole surface is filed as straight and smooth as possible. Leave from five to eight ten-thousandths (.0005 to .0008) of an inch for polishing the work.



For polishing work that is well-balanced, set change levers to give the highest possible speed. On unbalanced work, run the lathe at highest speed possible without vibration. A speed lathe is best for straight shafts one inch or less in diameter.



Use strip of emery or carborundum paper of fine grade and press against work, moving abrasive cloth from side to side to cross lines and bring work to rough polish without cutting rings. Use very fine abrasive cloth and oil on work for final polish.

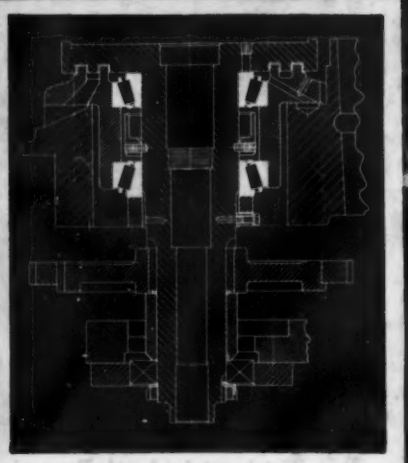


Watch out for heat! Remember, polishing and filing heat the work. When measuring with a micrometer, either cool the work by immersing in water or else make an allowance of one or two ten-thousandths of an inch for cooling of work.

ARMY E NAVY

Largest Manufacturer of a Complete Line of Lathes

WHERE SPEED GOES HAND-IN-HAND WITH PRECISION—AND TIMKEN BEARINGS WITH BOTH . . .



Application of Timken Bearings on the spindles of Bullard Mult-Au-Matics.